Punch List for South Texas Project Units 3 & 4
Sections 3.7 & 3.8

Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
1			Mesh sensitivity Reviewed during March Audit		**03.07.02-25, R1** **03.07.02-29, R1** **03.07.02-22**	3/15/11	May Audit 3.7 - D.
2					**03.07.02-28**	3/15/11	May Audit 3.7 - D.
3	**N/A**		Provide ITAAC to close 10CFR21 issue related to dynamic analysis of the Turbine Building		**03.07.02-31**	3/28/11	May Audit 3.7 - D.
4			Site Specific Seismic Analyses of Radwaste Building • Amplified input motion considering the effect of nearby Reactor Building • Fixed base seismic analysis for determination of seismic SSE forces for II/I design Not Audited by NRC NRC Complete Audit		**N/A**	N/A	May Audit 3.8 - C. 13.1 3.8 - C. 13.2
5	**3.7-1**		NRC would like to have an ITAAC for II/I design in addition to the current discussions in COLA, RAI 03.07.02-20		**03.07.02-20 S1**	4/13/11	May Audit 3.7 - D.
6	**3.7-3**		Check RSW Piping Tunnel SSI analysis description to see if it fully describes how the motion at various points of tunnel were addressed and/or amplified		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
7	**3.7-4**		Check DGFOS VAULT SSI analysis description to see if it fully describes how the motion at various points of vault were addressed/amplified Provide additional description in COLA, as needed. See Item 3.7-22		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
8		**9**	In DGFOSV calcuation for SSI analysis, U7-CALC-DSN-6001, Rev. B, the refined model spectra values are 14.6% higher at 3.8 Hz. than those in the base model. The applicant is requested to provide justification for reconciling this difference. Clarification Issue 9, No further action, answered on a previous RAI		**N/A**	5/17/11	May Audit 3.7 - D.
9	**3.7-5**		Check DGFOS TUNNEL SSI analysis description to see if it fully describes how the motion at various points of tunnel were addressed and/or amplified. Provide additional description in COLA, as needed. See Item 3.7-22		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
10	**3.7-6**	**2**	Identify soil cases used for all SSSI analysis, and provide basis. As a minimum for All SSSI anlaysis upperbound and upperbound backfill should be considered. Review COLA markup for consistency with soil cases analyzed.		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - F. f.
11	**3.7-8**	**2**	Why for SSSI of RSW Tunnel was UB in situ used vs UB backfill soil As a minimum for All SSSI anlaysis upperbound and upperbound backfill should be considered. Review COLA markup for consistency with soil cases analyzed.		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - F. f.
12	**3.7-36**	**2**	Confirm that as a minimum for All SSSI anlaysis upperbound in-situ and upperbound backfill should be considered. Provide additional information in RAI response as appropriate		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - F. f.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
13	**3.7-7**	**1**	Revise Appendix 3A and 3H.6 to reconcile ground water elevation with Chapter 2 Demonstrate that soil springs values due to groundwater elevation reconciliation do not affect foundation design Demonstrate that calculated gap values are not affected by due to groundwater elevation reconciliation for settlement analysis		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - F. g.
14		**3**	Clearly describing in the FSAR how seismic demand for non-seismic II/I structures for stability evaluation is determined	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
15	**3.7-10**		Clarify SSSI soil pressures in COLA figures to indicate that they represent envelope of all soil cases analyzed		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
16	**3.7-11**		Include in FSAR the following information for the time histories developed for 0.3g, 1.60 Reg. Guide spectrum: 1) Development method by reference to DCD; 2) Plots of three acceleration time histories; 3) Comparison of 5% response spectra		**03.07.01-2 S2**	4/13/11	May Audit 3.7 - D.
17	**3.7-15**		Frequency/acceleration evaluation for UHS columns with and without hydrodynamic mass Determine column accelerations for column mass and hydrodynamic mass based on column frequency and spectra at top and bottom of the columns and revise RAI 03.08.04-30 supplement 1 to report new information	S&L Javad Moslemian	**03.08.04-30 S4**	6/30/11	
18	**3.7-18**		Effect of structural mesh refinement on maximum acceleration for design In the manual calculation for design of PH Roof slab, increase the vertical seismc load for PH Roof based on examination of structural mesh sensitivity results	S&L Javad Moslemian	**03.08.04-30 S4**	6/30/11	
19	**3.7-2**		Determine if FSAR (Appendix 3C) revision is required for the use of computer programs used by Westinghouse Will provide information in COLA		**03.07.01-2 S2**	4/13/11	May Audit 3.7 - D.
20		**7**	Justify comparison of SAP2000 to ANSYS		**03.07.02-29 S1**	5/10/11	May Audit 3.7 - E.
21	**3.7-28**	**6**	SASSI Validation - Run aspect ratio problem with reduced shear wave velocity in vertical direction and get transfer function at the center of the slab S&L to revise the SASSI2000 test problem for two way slab action to match that by SGH. Add a cautionary note to SASSI2000 release memo for users to examine transfer functions for any sign of instability		**03.07.02-29 S1**	5/10/11	May Audit 3.7 - E.
22	**3.7-19**		Provide a figure in COLA showing 0.3g Reg. Guide 1.60 spectra envelopes amplified motions for all three storage vaults		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
23	**3.7-22**		Include amplified site-specific spectra for RSW Piping Tunnel, DGFOSV, and DGFO Tunnel in FSAR		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
24	**3.7-26**		Confirm that DGFO tank rigidty requirement is included in the procurement specification		**N/A**		May Audit 3.7 - F. h.
25	**3.7-27**		Consolidate all 03.07.01-27 responses. Also include the spectra comparisons for what was done in the audit for cracked concrete cases. **With reader's guide provided, there is no need to consolidate 3.7.1-27. Spectra comparisons will be provided.**		**03.07.01-27 S3**	5/17/11	May Audit 3.7 - D.
26	**3.7-28**	**6**	SASSI Validation - Run aspect ratio problem with reduced shear wave velocity in vertical direction and get transfer function at the center of the slab		**03.07.02-29 S1**	5/10/11	May Audit 3.7 - E.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
27	**3.7-33**	**8**	For Es use the SSSI pressure diagram as the driving force in the stability evaluation and using passive on the resisting side for FOS Vault, RSW Piping Tunnel, FOS Tunnel Provide requested information in RAI response	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
28	**3.7-35**	**8**	Confirm for FOS Vault that E' is more than the inertial force for amplified site-specific SSI analysis in the stability evaluation Provide requested information in RAI response	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
29			Perform sensitivity analysis related to Poisson's Ratio	NRC		N/A	May Audit
30		**13**	**Clarification Issue 13** **For the Radwaste Building, provide additional information and/or justification for the following:** **1. Design and Analysis (3H.3.5.1 & 2)** **2. II/I Analysis and design (3H.3.5.3)** **3. Load Combination for Shear (Steel) (3H.3.4.3.4.2)** **4. Ultimate soil bearing capacity (3H.3.4.2.1)** **5. Tornado Parameters (3H.3.B & 3H.3.4.3.3.1)** **6. Flood Design (3H.3.4.2.3)**		**N/A**	N/A	May Audit 3.8 - C. 13.
31			Reviewed during March Audit		**03.08.04-18**	3/15/11	May Audit 3.8 - C. 13.2
32			Reviewed during March Audit		**03.08.04-18 R1 S2**	3/15/11	May Audit 3.8 - C. 13.4
33			Design of DGFOT including design considerations for seismic wave propagation • Design inputs • Structural analysis model • Design of walls, floors, foundations, and other structural components • Stability evaluation Not Audited by NRC in March Audit		**03.08.04-30 S1**	3/15/11	May Audit 3.8 - H.
34			Design of UHS/RSW Pumphouse • Design inputs • Structural analysis model • Design of walls, floors, foundations, and other structural components • Stability evaluation Not Audited by NRC in March Audit		**03.08.04-30 S1**	3/15/11	May Audit 3.8 - A.
35			During the audit held on October 18 through 22, 2010, the staff noted that the applicant did not include foundation bearing pressure calculations for wind and tornado loadings for UHS/PH The applicant agreed to include the bearing pressure evaluations for wind and tornado in its calculations for the UHS/PH accordingly.		**N/A**		May Audit 3.8 - A.
36		**14**	Clarification Issue 14 For all Site-Specific Category I Structures, provide additional information and/or justification for extreme wind and tornado loading (3H.6.4.3.2)		**N/A**	N/A	May Audit 3.8 - C. 14.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
37	**3.8-1**		**RAI 03.08.01-9** +/- 25% of the gap: How does this compare to long term settlement values? Clarify if 25% movement envelopes long term settlement. The 25% movement envelops the expected long term settlement at the RB/CB interface, below flood level Revise response to RAI 03.04.02-6 & 03.08.01-9 to require the testing to be the maximum of +/- 25% or long term settlement.		**03.08.01-9 S1**	4/13/11	May Audit 3.8 - E.
38	**3.8-2**		For Section 3H.6-7 in **RAI 03.08.04-17, Supplement 1**, provide clarification for last line of the first paragraph. (*Clarify that envelop of SSSI pressure and ASCE 4-98 is used.)* **Revise response to RAI 03.08.04-17 Supplement 1 to clarify that the envelop is used.**		**03.08.04-17 S1**	4/26/11	May Audit 3.8 - E.
39	**3.8-3**	**11**	**RAI 03.08.04-28** Bullet 4: Show the basis for reductions in the dynamic resistance coefficients (Part C of question). Explain in revised response to RAI 03.08.04-28 how values were determined (from MACTEC calculation) **Clarification Issue 11** **Applicant is requested to provide a comparison between the strain ranges assumed in the above reference and the strain values expected beneath the foundation of Cat I buildings of Units 3&4.**		**03.08.04-28 S1**	4/26/11	May Audit 3.8 - E.
40	**3.8-5**		**RAI 03.08.04-32** NRC to compare response to other applicant responses.			N/A	
41	**3.8-6**		**RAI 03.08.01-7, Rev. 2** Review response - should the pressure loading be based on a flood height of 8' vs. 7'? The pressure loading should be based on a height of 8', but this does not change the result. Revise response to RAI 03.08.01-7 and related responses to clarify this.		**03.08.01-7 S1**	4/13/11	May Audit 3.8 - E.
42	**3.8-7**		Docket the design parameters table (Agenda Item A)		**N/A**	4/18/11	May Audit 3.8 - B. 1.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
43	**3.8-8**	**4** **5**	Concrete and concrete to waterproofing friction coefficient of 0.6 is based on static, but soil coefficient of 0.47 is based on dynamic. Revise RAI 03.08.04-28 or 03.08.04-19 to show revised required static coefficient of friction of concrete and membrane increased to ≥ 0.75 Clarification Issue 4 Designate whether the friction coefficients reported in Table 3H.6-14 are static or dynamic coefficient of friction values. (Revise response to RAI 3.7.2-13 S1) Clarification Issue 5 (No action required)		**03.08.04-19 S1** **03.07.02-13 S2**	4/26/11	May Audit 3.8 - B. 2. 3.8 - C. 4.
44		**16**	Clarification Issue 16 Provide additional information and/or justification for specified minimum static coefficient of friction at the various interfaces, specifically at the waterproofing membrane. Also, the requirement of intentionally roughening the concrete surface should be included in the FSAR.			N/A	May Audit 3.8 - C. 16.
45	**3.8-9**		S&L to evaluate method of reconciliation for soil pressure from equivalent pressure method for bearing pressure evaluation and soil pressure from finite element analysis. Formally provide the proposed reconciliation method in response to RAI 3.8.4-35.		**03.08.04-35**	4/11/11	May Audit 3.8 - B. 3.
46	**3.8-9**		S&L to perform the reconciliation evaluation Formally provide the proposed reconciliation method in response to RAI 3.8.4-35. Refer to Punch List Item 93 (Action Item 3.8-38)			6/15/11	May Audit 3.8 - B. 3.
47		**15**	Clarification Issue 15 Provide additional information and/or justification for foundation bearing pressures reconciliation.			N/A	May Audit 3.8 - C. 15.
48	**3.8-11**		Review the wind loading used for design and stabilty calculations for the vault. NRC to review the justification for the importance factor for wind pressure calculation provided in response to RAI 03.08.04-30 Supplement 1			N/A	May Audit 3.8 - B. 4.
49	**3.8-12**		Discuss with John Price delivery of the Reviewer's Guide to NRC		**N/A**	4/8/11	May Audit 3.8 - E.
50		**17**	Clarification Issue 17 Miscellaneous Questions from Audit and Reviewers Guide			N/A	May Audit 3.8 - C. 17.
51	**3.8-15**		DGFOSV design calculation: Confirm the tornado wind load used in design, pg. 26 Revise design parameters table (See Item 3.8-7).		**N/A**		May Audit 3.8 - E.
52	**3.8-16**		DGFOSV design calculation: Verify acceleration values on pg. 113 with Attachment B Determine the latest revision of the SSI calculation. Ref. 7.19 (design) vs 7.30 (stability). B is the correct revision; reference in stability calculation will be revised in the calculation. (PIP 2011-0365)		**N/A**	N/A	May Audit 3.8 - E.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
53		**10**	As both, the SASSI and the SAP models, should be based on the same geometry and total weight and are subject to the same absolute accelerations, it is not apparent why an additional, relatively large amplification would be needed in vertical direction to obtain comparable total base seismic loads. Therefore, the applicant is requested to provide a justification regarding the different behavior of both structural models.		**03.08.04-30 S2**	5/17/11	May Audit 3.8 - C. 10.
54	**3.8-20**		Use of newer version of ACI-349 & ASME Section III, Division 2 Codes, Respond to RAI 03.08.04-36		**03.08.04-36**	4/11/11	May Audit 3.8 - E.
55	**3.8-21**		Beam shear discussion Commitment to incorporate NRC feedback will be provided in an RAI Response		**03.08.04-34**	4/11/11	May Audit 3.8 - E.
56	**3.8-21**		Beam shear discussion Calculations will be revised and FSAR tables will be updated as a Confirmatory Action	S&L Javad Moslemian	**03.08.04-30 S6**	8/17/11	
57	**3.8-22**		Attach Supplement to the release memo for SAFE (regarding shear)		**N/A**	N/A	May Audit 3.8 - B. 6.
58			Audit Report 3.8 K. Computer Software Validation and Verification, PCACOLUMN, Version 4.10 ACI 349-97 used in STP 3&4 design is not covered by this V&V, however it was assured that results from PCAColumn are evaluated in the calcs against the special code requirements in ACI 349-97. The staff needs to review in further detail how this assurance is implemented. This will be included in the next audit.		**N/A**	N/A	
59	**3.8-23**		Verify that 0.21 g used in the basic design of RSW Tunnel envelopes the seismic accelerations Provided SGH calculation showing where the enveloping accelerations came from		**N/A**	N/A	May Audit 3.8 - B. 7.
60	**3.8-24**		RSW Tunnel: Confirm that soil pressures consider additional wave propagation effect Calculation will be revised		**N/A**	N/A	May Audit 3.8 - B. 7.
61		**12**	Applicant is requested to explain the apparent discrepancy with the 3,000 ft/sec sheer wave velocity denoted in the COLA and a value of 6,600 ft/sec used for the wave propogation effect in the calculationscalculation. Calculation will be clarified or revised		**N/A**	N/A	May Audit 3.8 - C. 12.
62			Not Used			N/A	N/A
63			Audit report 3.8 I 8. Calculation no. U7-RSW-S-CALC-DESN-6001, Revision D, “Basic Structural Design of Reactor Service Water (RSW) Tunnel”. The staff noted that several areas of design of the tunnel were not complete at time of the audit, e.g., global tornado missile impact evaluation for the access region of the tunnel, tunnel walls in the corner region, access covers, etc.		**N/A**	N/A	
64	**3.8-25**		Revise Control Building Annex stability calculation to eliminate statement regarding design being applicable to DCD Standard Plant Calculation will be revised		**N/A**	N/A	May Audit 3.8 - B. 8.

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Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
65		**18**	Comments on Response to RAI 03.07.02-22 On the COLA Markup, Section 3H.6.6.2.1 UHS basin, UHS Cooling Tower Enclosure, and RSW Pump House, provide an explanation of the pressure distribution for the calculated seismic soil pressures on the RSW Pump House North Wall shown in Figure 3H.6-219 from 2D SSSI.			May Audit 3.7 - F	May Audit 3.7 - F
66		**19**	Comments on Response to RAI 03.07.02-24, Supplement 1, Revision 1 On the COLA Markup, Section 3H.6.5.3 Seismic Analysis of RSW Piping Tunnel, in the 4th bullet on the following page (Page 11 of 27), please clarify for which soil case the cracked concrete and soil separation analysis was performed. This information is not provided in the COLA markup.			See Action Item 3.7-48	See Action Item 3.7-48
67		**20**	Comments on Response to RAI 03.07.01-27, Supplement 1, Revision 1 On the COLA Markup, Section 3H.6.7 Diesel Generator Fuel Oil Storage Vault (DGFOSV), provide further clarifications why two different input motions are developed and used in separate SSI analyses of DGFOSV			May Audit 3.7 - F	May Audit 3.7 - F
68		**21**	Comments on Response to RAI 03.07.02-29, Supplement 1 Post Audit Clarification Issue #6 submitted as part of the response to RAI 03.07.02-29, Supplement 1. Because the shape of the response transfer functions are strongly dependent on the a_o value (e.g. as shown in Fig. 03.07.02-29 S1.6 provided with this response), the applicant is requested to extend the results of the above test problems in terms of the foundation response transfer functions (including both compliance and scattering functions) calculated using the subtraction method to ao values up to at least 8. Issue a revision to the SASSI Release Memo.	S&L Javad Moslemian	**Update Release Memo**	6/30/11	
69		**22**	DNFSB Issues Related to the SASSI Subtraction Method The Defense Nuclear Facilities Safety Board (DNFSB) issued a letter on April 8th, 2011 requesting the Department of Energy (DOE) to address technical and software quality assurance issues related to potentially erroneous seismic analyses performed using the SASSI Subtraction method. SASSI subtraction method has been used for STP application for embedded structures. As such, the applicant is requested to review these concerns and assess the potential impact on STP's seismic analysis.			See Action Items 3.7-37 & 3.7-38	See Action Items 3.7-37 & 3.7-38
70			Audit Report 3.8 D2 5. "The accelerations are taken from the SSI analysis of the vault. A reference is given in the report from where the accelerations were taken. As this information was not verified during the audit, the staff plans to verify the source and the acceleration values during the next audit."			N/A	
71	**3.7-37**		Provide in an RAI response a plan to resolve the issues related to subtraction method in SASSI, as described in the DOE letter. (Clarification Issue 22)	S&L Javad Moslemian	**TBD**	**TBD**	
72	**3.7-38**		Subsequent to Action Item 3.7-37, revise the results presented in COLA as necessary. (Clarification Issue 22)	S&L Javad Moslemian	**TBD S1**	**8/17/11**	
73	**3.7-39**		Revise RWB stability calculation considering amplified motion at ground surface and revise COLA as necessary.	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
74	**3.8-26**		Revise the response for Importance Factor used for wind loading (RAI 03.08.04-30 S1) to state that our position is deviating from SRP 3.3 guidance based on the justification provided in the RAI response. Also revise the Importance Factor from 1.15 to 1.0. (Clarification Issue 14)	S&L P. K. Agrawal	**03.08.04-30 S3**	6/20/11	
75	**3.8-27**		Update the design parameters table with damping values for Radwaste Building Design, and include the table in Section 3.8 of COLA. (Clarification Issues 13.6 and 17.6)	S&L P. K. Agrawal	**03.08.04-30 S3**	6/20/11	
76	**3.8-28**		Examine amplified input motion used for Service Building stability evaluation.	S&L Javad Moslemian		See Action Item 3.8-27	See Action Item 3.8-27

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Punch List Item	AI No.	CI I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
77	**3.8-29**		Clarify response to RAI 03.08.04-19 to state that the static coefficient of friction at the interface of mudmat and soil will not exceed 0.75. Also include the requirement for roughening the concrete surfaces in the COLA. (Clarification Issue 16)	S&L P. K. Agrawal	**03.08.04-19 S2**	6/20/11	
78	**3.8-30**	**17.3**	Provide more legible Figures 3H.6-138 and 139 in COLA. (Clarification Issue 17.3)	S&L P. K. Agrawal	**03.08.04-30 S3**	6/20/11	
79	**3.8-31**	**17.4**	Add in the FSAR that the Large Equipment Access Building (LEAB) foundation will be designed such that the surcharge on the DGFOSV located directly east of the LEAB will be negligible. (Clarification Issue 17.4)	S&L P. K. Agrawal	**03.07.01-27 S4**	7/8/11	
80	**3.8-32**	**17.1**	The COLA will be revised to refer to Figures 3H.6-212 through 3H.6-217 for RSW Piping Tunnel design. (Clarification Issue 17.1)	S&L Javad Moslemian	**03.07.01-27 S4**	7/8/11	
81	**3.8-33**	**17.5**	Clarify title for Figure 3H.6-137 to specify that it is applicable to Category I site-specific structures (Clarification Issue 17.5)	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
82	**3.8-34**	**12**	Revise the wave propagation calculations for the tunnels using the following: 1) an apparent wave velocity of 3000 ft/s 2) maximum ground velocity based on site-specific SSE maximum ground acceleration of 0.13g 3) a triangular pressure distribution limited by the maximum passive pressure Revise COLA to reflect these changes also. (Clarification Issue 12, AI 3.8-23 and 3.8-24)	S&L Javad Moslemian	**03.08.04-30 S5**	7/18/11	
83	**3.8-35**	**3 8**	Provide in COLA the discussion of stability evaluation for each structure including a discussion of the input motion. (Clarification Issues 3 and 8)	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
84	**3.8-36**		Verify equivalent static loading for RSW Piping Tunnel and Fuel Oil Tunnel exceed that from SSI	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
85	**3.7-40**		Provide response to questions on lateral pressure diagrams	S&L Javad Moslemian	**N/A**	See action items 3.7-42 and 3.7-44	See action items 3.7-42 and 3.7-44
86	**3.7-41**		Discuss the effects of groundwater change on UHS responses	S&L Javad Moslemian		See action item 3.7-46	See action item 3.7-46
87	**3.7-42**		Revise Figure 3H.6-219 to remove 2D 'Alone' soil pressure profile. Also revise the figure to provide seismic pressure profile used for design in lieu of static + dynamic. Also check other figures for the same issues.	S&L Javad Moslemian	**03.07.01-27 S4**	7/8/11	
88	**3.7-43**		Add the factor of safety for floatation in Table 3H.6-14	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	
89	**3.7-44**		Verify that SGH's validation for SASSI included verification for soil pressures and provide validation for NRC review	S&L Javad Moslemian		N/A	N/A
90	**3.7-45**		Turbine Building Seismic Calculation, Fluor calculation number U3-TB-S-CALC-DESN-2100 Rev B, should be revised for the following: 1) Assumption 1 on sheet 9 of 288 should be clarified to clearly describe how mass and stiffnesses were derived from different Turbine Building models 2) On sheet 8 of 288, correct Reference 3 document number from U3-TB-S-CALC-DESN-2001 to U7-TB-S-CALC-DESN-2001 3) Revise Section 5.15 to clearly describe how the seismic demand was determined. For example, clarify the statement in the last paragraph of sheet 250 "after running the RSA static analysis is then run with the RSA results to determine the base shear". Also describe how the RISA anlaysis was done in 3 directions and how the 3 directional responses were combined.	TANE Jim Fisicaro			

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Sections 3.7 & 3.8

Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
91	**3.7-46**		For groundwater resolution, in addition to the RAI response provided, perform the following: 1) Use 28 ft groundwater level in the analysis being performed for DOE letter (AI 3.7-37) 2) Revise the COLA markup provided in the previous RAI response 03.07.01-27 S3 3) Revise the SSI calculations to add a clarification for groundwater level	S&L Javad Moslemian	**TBD S1**	**8/17/11**	
92	**3.8-37**		For Radwaste Building, revise the COLA for the following: -- Add clarification in Section 3H.3.5.1, 2 and 3 for seismic analysis models (stick model for stability, FEM model for design and II/I) [Clarification Issue 13.1] -- Delete vertical accelerations from Table 3H.3-1 [Clarification Issue 13.1] -- Revise Section 3H.3.4.3.4.2 to include N690 provision for shear allowable [Clarification Issue 13.3] -- Revise Section 3H.3.4.2.1 to state that bearing pressure capacity is determined using methodology described in COLA Section 2.5S.4 [Clarification Issue 13.4]	S&L Javad Moslemian	**03.08.04-18 S3**	7/28/11	
93	**3.8-38**		Revise response to RAI 03.08.04-35 to explain design in lieu of further analysis for equivalent bearing pressure.	S&L Javad Moslemian	**03.08.04-35 S1**	6/30/11	
94	**3.8-39**		Provide questions on Turbine Building and Service Building stability calculations by about 10 a.m. on 5/26	NRC Chakrabarti		See Action Item 3.7-45	See Action Item 3.7-45
95	**3.8-40**		Discuss additional information to be included in COLA for II/I evaluations of non-seismic Category I structures with OGC	NRC Tom Tai		N/A	
96	**3.8-41**		Revise UHS design calculation to use N690-1994 Supplement 2	S&L Javad Moslemian	**U7-UHS-S-CALC-DESN-6002** **U7-YARD-S-CALC-DESN-6001**	6/30/11	
97	**3.7-47**		For Service Building stability calculation (U3-SB-S-CALC-DESN-2100 Rev. B), expand Section 5.14 to fully describe how the seismic analysis was performed and specifically address the following: 1) How the stick model mass and stiffness were calculated or provide a copy of Ref. No. 23, U3-SB-CALC-DESN-2001 Rev. 0, "Calculation of Service Building Mass and Stiffness Model" for review. 2) RSA details: - 1. modal combination method - 2. combination of 3 directional responses Attachment 01 sheets 4 and 5 - 1. What are modes 5 and 6 with frequency > 3.0x108 Hz? Write Condition Report to document response and track calculation revision. See Action Item 3.8-40.	TANE Jim Fisicaro			
98	**3.7-48**		Clarify COLA Section 3H.6.5.3 to specify that UB Backfill soil case was used for cracked and separated cases (Clarification Issue 19)	S&L Javad Moslemian	**03.08.04-30 S3**	6/20/11	
99	**3.7-49**		Revise calculation U7-UHS-C-CALC-DESN-6007 to delete Table 3 (Reference March 2011 audit report)	S&L Javad Moslemian	**U7-UHS-C-CALC-DESN-6007**	7/28/11	
100			Not Used			N/A	N/A
101	**3.8-42**		Revise the Control Building Annex stability evaluation to use ASCE 7-05 instead of ASCE 7-88. Also remove the live load from the calculation of the stabilizing force.	S&L Javad Moslemian	**03.07.02-13 S3**	7/28/11	

Punch List for South Texas Project Units 3 & 4
Sections 3.7 & 3.8

Punch List Item	AI No.	Cl I	Action Item Description	Responsible Engineer	RAI	Letter to NRC	NRC Review
102	**3.8-43**		Audit Report Section 3.8 I 8. Calculation no. U7-RSW-S-CALC-DESN-6001, Revision D, "Basic Structural Design of Reactor Service Water (RSW) Tunnel". The staff noted that several areas of design of the tunnel were not complete at time of the audit, e.g., global tornado missile impact evaluation for the access region of the tunnel, tunnel walls in the corner region, access covers, etc. Include the closure in the May audit report	NRC Chakrabarti		N/A	

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 1 [Received 04/04/2011] (Audit Action 3.7-7): Revise Appendix 3A and 3H.6 to reconcile ground water elevation with Chapter 2

Inconsistencies were noted among various Sections of the FSAR concerning the specified design ground water level and the ground water level used in the seismic analysis for Category I structures. For example in FSAR Section 2.4S.12.5, it is stated that *"In summary, based on measured groundwater levels in observation wells and modeled post-construction groundwater levels, the maximum post-construction groundwater elevation at the STP Units 3 and 4 site is estimated to be 28 ft MSL, as reflected in Table 2.0-2. The nominal finished plant grade in the power block area is approximately 34 ft MSL,* ***six feet*** *higher than the site characteristic maximum groundwater level."* Appendix 3H.6.4.2.2, Design Ground Water Level, also specified ground water level at 28 MSL establishing the depth of water table at **six feet** below the grade.

However, in Section 3A.15, Site Conditions, it is stated that *"Based on the site groundwater conditions described in FSAR Subsection 2.4S.12, the groundwater elevation of approximately* ***eight feet*** *below grade was used in the analysis to determine the soil properties."* It is also noted that SSI model for the seismic analysis of Category I structures considered the ground water table to be approximately at **eight feet** below the grade elevation. As such, the applicant is requested to address these inconsistencies among various sections of the FSAR and the seismic analysis model and revise the applicable FSAR sections on groundwater level and structural design criteria. The applicant is specifically requested to demonstrate that the FIRS, GMRS, and the results of seismic analysis of the Category I structures including the results of stability calculations as currently established in the COLA are not adversely affected and include this justification in the applicable FSAR sections.

Issue 2 [Received 04/04/2011] (Audit Action 3.7-6/3.7-8/3.7-36)**:** Why for SSSI of RSW Tunnel was UB in situ used vs. UB backfill soil?

Review of responses to RAI 03.07.01-27, Supplements 1, Revision 1 indicates that two 2D SSSI models (East-West and North-South Sections) are analyzed to evaluate the effects of nearby structures on the three DGFOSVs and calculate the seismic soil pressures. In the East-West direction 2-D SSSI DGFOSV model (DGFOT 1C + DGFOSV 1A + CFRW), five cases of soil and backfill properties are considered to evaluate the effects of the soil and backfill properties variation. Also response to RAI 03.07.01-27, Supplement 2, Revision 2 indicates that in the East-West direction for DGFOT 1A (RB + DGFOT 1A + CFRW), five cases are run with various combinations of soil and backfill properties. However, in the North-South direction **(UHS/RSWPH + RSW Tunnel + DGFOSV 1B + DGFOSV 1C + RB),** only one case was run with UB soil properties.

Also as discussed in response to RAI 03.07.02-24, Supplement 1, Revision 1, in the East-West direction for dynamic soil pressure evaluation for RSW Tunnel and RWB walls, the 2 D SSSI model **(RB + RSW Tunnel + RWB)** included only the UB in situ soil without any evaluation for backfill properties. As such, the applicant is requested to demonstrate that consideration of only UB soil profile instead of using a combination of UB soil and backfill parameters for the cited cases will still be conservative for the wall design of all site specific Category I and RWB structures (UHS/RSWPH, DGFOSV, RSW Tunnel, UHS/and RWB). The applicant is also requested to include this evaluation in the applicable sections of the FSAR.

Issue 3: [Received 04/04/2011; New Action Item] Clearly describing in the FSAR how seismic demand for non-seismic II/I structures for stability evaluation is

It is not clear from the descriptions in the FSAR as to how the seismic demand is determined for the site-specific stability evaluation of the non-seismic II/I structures considering the influence of nearby heavy structures during SSE. As such, the applicant is requested to describe in sufficient detail in the FSAR the following information:

1. How the input motion at the foundation level of the non-seismic II/I structures are determined using the site specific SSE input spectra applied at the ground surface
2. How the effects of nearby heavy structures are included in the input response spectra for various soil and backfill conditions
3. Demonstrate that horizontal input response spectra at the foundation level of non-seismic II/I structures is broad band spectra with peak acceleration greater than 0.1g and envelops FIRS
4. Types of seismic analysis performed to determine seismic demand for stability evaluation (i.e., fixed base analysis, equivalent static or dynamic analysis, or SSI analysis) and how the input is specified in the analysis
5. Include 5% damped input response spectra (vertical and horizontal) as amplified by the presence of nearby heavy structures used in the seismic demand evaluation for site-specific stability analysis for non-seismic II/I structures

Discuss or refer to appropriate FSAR section of any differences in the method of stability evaluation from that of Category 1 structures

Issue 4: [Received 04/04/2011] (Audit Action Item 3.8-8) Sliding Friction Coefficients reported in Table 3H.6-14

Designate whether the friction coefficients reported in Table 3H.6-14 are static or dynamic coefficient of friction values.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 5: [Received 04/04/2011] (Audit Action Item 3.8-8) Referencing Table 3H.6-5

Section 3H.6.6.5 refers to Table 3H.6-5 for factors of safety against sliding and overturning for RSW piping tunnel. However, Table 3H.6-5 provides values for RSW pump house. Please verify the acceptability of this reference Table.

Issue 6: [Received 04/04/2011] (Audit Action Item 3.7-28) SASSI2000 Subtraction Method Validation

In reviewing the SGH SASSI2000 V&V of the subtraction method, it was found that the test problems (SAS-3C, SAS-4C and SAS-8) are not analyzed to sufficiently high enough frequencies that can validate the stability and accuracy of the subtraction method for passing frequency of $V_s/5h$, where V_s is the lowest shear wave velocity of the foundation media and h is the largest element size in the soil model.

In the case of S&L SASSI2000 V&V Test problems 4 and 8 used in validation of the subtraction method, the analyses were carried out to sufficiently high frequencies to cover the passing frequency requirement of $V_s/5h$. However, the conclusion does not address the stability and accuracy of the subtraction method used in the context of the calculated results.

In both cases, the applicant is requested to revisit the test problems and provide validation that adequately addresses the stability and accuracy of the subtraction method in relation to the acceptable passing frequency of $V_s/5h$ used in the STP 3&4 design.

Issue 7: [Received 04/04/2011; New Action Item] SAP2000 V&V

The response to RAI.03.07.02-29, Rev. 1, documents additional validation problems for SAP 2000. The validations include:

1) Section cuts
2) Thick shell out-of-plane response
3) Time history modal superposition with shell elements
4) Spectra calculation using thick shell elements

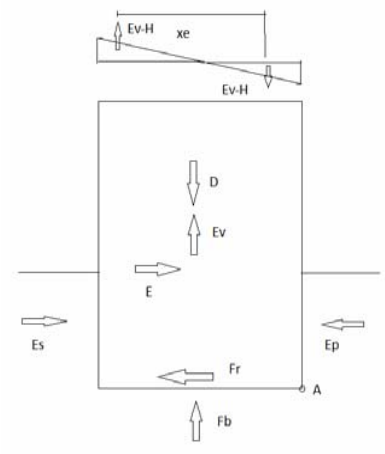
Validation of item “1” was done by hand calculation. For items “2”, “3” and “4”, the benchmark solutions for validation were developed with ANSYS utilizing “SHELL43 “element, which is well suited to model linear, warped, moderately-thick shell structures according to ANSYS User’s Manual. For items “2”, “3” and “4”, the following acceptance criteria were used: 5% for frequencies, 10% for forces, and 15% for spectra. The 5% difference is considered acceptable within the engineering accuracy, while the 10% and 15% criteria may be excessive. The applicant is requested to assess the impact of the above acceptance criteria on the STP 3&4 design.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 8: [Received 04/04/2011] (Audit Action Item 3.7-33 and 35) Stability Analysis Procedure

A brief presentation of the stability analysis procedure was made by the applicant during the March 14, 2011 audit. The presentation included a rigid body diagram showing the forces acting on the structure for stability calculations. The applicant indicated that the total seismic demand is calculated by summing all the inertia forces and moments acting on the structure. These inertia forces are calculated by multiplying the mass of each node by the absolute value of the maximum acceleration response at that node obtained from the SSI analysis.

The calculation of the seismic overturning moment is based on the horizontal seismic load E and vertical seismic load Ev about tipping point A, as shown in the figure below. The moment due to horizontal earthquake does not include Ev-H (vertical force due to horizontal input) which also produces overturning moment about A. The applicant is requested to provide justification for not including the vertical component of response due to horizontal seismic input in calculating the foundation overturning moment.



E – Horizontal seismic force

E_v – Vertical seismic force

E_s – Soil active force

E_p – Soil passive resistance

D – 0.9 of dead load

F_b – Buoyancy force

F_r – Frictional resistance

Issue 9: [Received 04/13/2011; New Action Item] DGFOSV Calculation U7-YARD-C-CALC-DESN-6001, Rev. B

In DGFOSV calcuation for SSI analysis, U7-YARD-C-CALC-DESN-6001, Rev. B, the refined model spectra values are 14.6% higher at 3.8 Hz. than those in the base model. The applicant is requested to provide justification for reconciling this difference.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 10: [Received 04/13/2011; New Action Item] (Issue 1 (New)): Calc Report, U7-YARD-S-CALC-DESN-6001, Rev. E: "Basic Structural Design of Diesel Generator
The seismic design of the DGFOSV is performed with equivalent static forces, whereby the inertial forces are computed as products of masses and accelerations. The accelerations are taken from the corresponding SSI analyses as to envelope all soil conditions, design parameters, and seismic input motions. The masses are determined form the building drawings and specific weights for concrete, oil, steel and soil. The SAP structural model is divided into regions, and constant average acceleration values are applied to each region, simulating the absolute acceleration distribution of the SSI model. These inertial forces are applied in global X, Y and Z direction as external static loading to the nodes and elements of the SAP model. The response quantities, i.e. internal forces, displacements, etc., resulting from each earthquake component are combined by the SRSS rule. As a verification of the equivalent static procedure, the resultant base shear, total vertical base force and overturning moments obtained from the SAP model are compared to the corresponding values of the SSI (SASSI) model. If required, adjustment factors are applied to the input acceleration components in SAP as to provide base forces and moments which envelope the corresponding SSI base values. The maximum resultant SSI absolute acceleration values are approximately: X=0.31g; Y=0.31g and Z=0.33g. The equivalent horizontal acceleration values obtained from the SAP analysis are: X=0.33g and Y=0.32g and therefore match closely the SSI accelerations. The equivalent vertical acceleration in the SAP analysis however, had to be amplified by a factor of about 1.27 to yield Z=0.42g, in order to meet the total base forces and moments from the SSI analysis. As both, the SASSI and the SAP models, should be based on the same geometry and total weight and are subject to the same absolute accelerations, it is not apparent why an additional, relatively large amplification would be needed in vertical direction to obtain comparable total base seismic loads. Therefore, the applicant is requested to provide a justification regarding the different behavior of both structural models.

Issue 11: [Received 04/13/2011; New Action Item] MACTEC Presentation on Friction and Cohesion Values used in Stability Evaluation of R/B
Lateral sliding stability against seismic loads is based on soil resistance at the foundation-soil interface (friction/ cohesion), and on lateral earth pressures acting on the embedded basement walls. Based on analyses and testing, dynamic friction and cohesion values are typically lower than the corresponding static values. Thus, for the STP units, static cohesion values are reduced 20% to account for dynamic soil behavior. The applicant's justification for this reduction is based on a publication by Makdisi and Seed from July 1978, which states that in most cases cyclic yield strength of clayey material appears to be 80% of the static undrained strength for typical shear strains obtained from earthquake soil response analyses. According to the above reference, the dynamic reduction of cohesion strength is shown to be significantly affected by the strain level present in the soil layers during a seismic event. Therefore, the applicant is requested to provide a comparison between the strain ranges assumed in the above reference and the strain values expected beneath the foundation of Cat I buildings of Units 3&4.

Issue 12: [Received 04/20/2011; New Action Item] (Action Item 3.8-24) RSW Tunnel Calculations
Applicant is requested to explain the apparent discrepancy with the 3,000 ft/sec sheer wave velocity denoted in the COLA and a value of 6,600 ft/sec used for the wave propogation effect in the calculations.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 13: [Received 05/04/2011; New Action Item] Comments on Response to RAI 03.08.04-18 R1 S2

1. Design and Analysis (3H.3.5.1 & 2)

These sections describe the seismic and structural analysis of the RW/B, whereby the seismic response accelerations are obtained from a fixed base stick model subjected to a 0.15 RG 1.60 input ground motion spectrum. These accelerations subsequently are applied to a refined 3D SAP FE model. The applicant is requested to explain why using a fixed base model was considered adequate. Furthermore, it is not clear what type of SAP analysis was performed and how the results from the seismic stick model analysis were applied to the 3D finite element model. Clarification should be given as to how local amplification effects, i.e. of slabs and walls are considered in the design. In a previous response the applicant stated that the influence of nearby heavy buildings, i.e. R/B, on the seismic input motion was considered. The applicant is requested to include in the FSAR how the effect of the adjacent R/B was considered in the input motion for the RW/B, and to include the input ground spectra for the appropriate damping used in design of the RW/B.

FSAR Table 3H.3-1 provides vertical accelerations for the RWB at three floor elevations. It is not clear why horizontal accelerations are not included in the FSAR. Please include the horizontal accelerations for the RWB in the FSAR.

2. II/I Analysis and design (3H.3.5.3)

FSAR Section 3H.3.5.3 states that for II/I design, the structure is conservatively designed to remain elastic. The earthquake input used at the foundation level is the envelope of 0.3g RG 1.60 response spectrum and the induced acceleration response spectrum due to site-specific SSE. However, the FSAR does not describe how the seismic analysis and design is performed using the seismic input motion. Please describe in the FSAR how seismic analysis and design is performed for the RWB for II/I design.

3. Load Combination for Shear (Steel) (3H.3.4.3.4.2)

FSAR Section 3H.3.4.3.4.2 provides load combinations for structural steel design for RWB. The sixth load combination has a stress coefficient of 1.6. According to ANSI/AISC N690-1994 (R2004), Supplement 2, Table Q1.5.7.1, Note g, the stress limit coefficient in shear shall not exceed 1.4 in members and bolts. The applicant is requested to note the above limitation in the FSAR.

4. Ultimate soil bearing capacity (3H.3.4.2.1)

This section shows static and dynamic ultimate soil bearing capacities for the RW/B. The applicant is requested to state in the FSAR how these values were derived.

5. Tornado Parameters (3H.3.B & 3H.3.4.3.3.1)

These sections show different parameters to define tornado loads which depend on the design goal. The Design Information Table provided at the Mar 2011 Audit Meeting differs from the definitions in the FSAR text and provides specific design parameters for three different situations: main design of the structure, stability analysis and II/I design. The applicant is requested to reconcile the information in the FSAR text with the contents of the Design Information Table, and to make reference to the table if it should be incorporated in the FSAR.

6. Flood Design (3H.3.4.2.3)

This section defines the DBF as 33 ft MSL and is taken to correspond to the DCD design parameter for flooding (one ft below grade). The Design Information Table differs from the definitions in the FSAR text and provides specific design parameters for three different situations: main design of the structure, stability analysis and II/I design. The applicant is requested to reconcile the information in the FSAR text with the contents of the Design Information Table, and to make reference to the table if it should be incorporated in the FSAR.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 14: [Received 05/04/2011; New Action Item] Comments on Response to RAI 03.08.04-30 S1

7. Extreme wind and tornado loading (3H.6.4.3.2)

In its response to this RAI the applicant uses Criterion 4 of SRP 3.3.1 to justify 50 year wind velocity in the wind pressure equation. However the staff notes that Criterion 4 just means that using table C6-7 of ASCE 7 is acceptable to convert 50 year into 100 year MRI and does not refer to the importance factor, and that therefore the procedure is not consistent with SRP 3.3.1, which requires a 100 year wind in addition to the importance factor of 1.15. This approach was also confirmed during the review of FSAR section 3.3.1. In light of recorded hurricane velocities exceeding 134 mph at the site, the staff needs to further evaluate this deviation from the SRP requirements. The staff also noted that the SRP 3.3.2 design requirements are met for tornado loadings (including the importance factor of 1.15), and that the tornado design thus follows the SRP recommendations.

Issue 15: [Received 05/04/2011; New Action Item] Comments on Response to RAI 03.08.04-35

8. Foundation bearing pressures reconciliation

In its response to this RAI the applicant states that the slab edges have to be fixed in order to perform the verification analysis. The applicant is requested to explain this approach, especially if boundary conditions which do not reflect real conditions are going to be introduced in the analysis. All possible load eccentricities (plus / minus components) need to be verified. Justification is needed to base the verification on only one load combination (with the lowest safety factor).

Issue 16: [Received 05/09/2011; New Action Item] Comments on Response to RAI 03.08.04-19, Supplement 1

9. Coefficient of Friction

In its response RAI 03.08.04-19, Supplement 1, dated April 25, 2011, the applicant addressed the issue of coefficient of friction raised in audit item 3.8-8. The applicant revised the site-specific ITAAC to require the waterproofing membrane to have a minimum static coefficient of friction of 0.75, and also provided a Table that specifies that the concrete to concrete interface joints will be intentionally roughened to have a minimum static coefficient of friction of 0.75. However, the applicant did not explain how the specified minimum static coefficient of friction at the various interfaces, specifically at the waterproofing membrane, was compared with the dynamic coefficient of friction of 0.47 assumed for soil, and considered acceptable. Also, the requirement of intentionally roughening the concrete surface should be included in the FSAR.

Issue 17 [Received 05/09/2011; New Action Item] Miscellaneous Questions from Audit and Reviewers Guide

1. FSAR Section 3H.6.4.3.3.3 refers to Figure 3H.6-44 and Figures 3H.6-245 through 3H.6-247 for lateral soil pressure for design of RSW Piping Tunnels. It is not clear why Figures 3H.6-212 through 3H.6-217, which provides lateral soil pressure on RSW Tunnels considering effects from adjacent RB and RWB, are not included here.
2. Figure 3H.6-44 in the Reviewer's Guide did not include the coordinate axes.
3. Figures 3H.6-138 and 139 are not clear, and, at least, the ZPA values should be annotated in the Figures.
4. Please describe if static surcharge pressures from adjacent buildings were considered in design.
5. For clarity, Figure 3H.6-137 should be appropriately annotated regarding its applicability.
6. Please clarify if the design table provided to us is going to be included in the FSAR. Because of the complexity of the various loadings used for the same building for various types of analysis, it is strongly recommended that this table be included in the FSAR.

Issue 18: [Received 05/19/2011; New Action Item] Comments on Response to RAI 03.07.02-22

COLA Markup, Section 3H.6.6.2.1 UHS basin, UHS Cooling Tower Enclosure, and RSW Pump House

The calculated seismic soil pressures on the RSW Pump House North Wall shown in Figure 3H.6-219 from 2D SSSI analysis with other buildings show a significant spike at depths of about 10 to 13 ft below grade with the pressures falling to zero from about 13 to 44 ft below grade corresponding to the bottom of RSW piping tunnel. Please provide explanation for this pressure distribution.

Issue 19: [Received 05/19/2011; New Action Item] Comments on Response to RAI 03.07.02-24,

COLA Markup, Section 3H.6.5.3 Seismic Analysis of RSW Piping Tunnel

In the 4th bullet on the following page (Page 11 of 27), please clarify for which soil case the cracked concrete and soil separation analysis was performed. This information is not provided in the COLA markup.

South Texas Project Units 3 & 4
Clarifications from NRC

Issue 20: [Received 05/19/2011; New Action Item] Comments on Response to RAI 03.07.01-27, COLA Markup, Section 3H.6.7 Diesel Generator Fuel Oil Storage Vault (DGFOSV)

The second and third paragraphs (Page 38 of 54) discuss two different types of input motions being developed for the seismic analysis and design of DGFOSV. Please provide further clarifications why two different input motions are developed and used in separate SSI analyses of DGFOSV, as discussed in the first paragraph on the following page (Page 39 of 54).

Issue 21: [Received 05/19/2011; New Action Item] Comments on Response to RAI 03.07.02-29, Post Audit Clarification Issue # 6

In response to Post Audit Clarification Issue #6 submitted as part of the response to RAI 03.07.02-29, Supplement 1 (submitted with letter U7-C-NINA-NRC-110075), the applicant has provided comparisons of the response transfer functions of a circular embedded foundation over elastic half space to theoretical solutions to validate the accuracy and stability of the SASSI2000 subtraction method. The response comparisons cover a frequency range corresponding to ao values less than 3, where a_o is a dimensionless parameter equal to $2\pi fr/V_s$, f is the frequency of analysis, r is the radius of foundation and V_s is the shear wave velocity of foundation media. The applicant has stated that comparisons of the response transfer functions for $a_o > 3$ is not performed because theoretical solutions obtained for similar problems by Apsel & Luco, 1986 are in agreement with the results of Day, 1978 for ao less than about 3, but the results start deviating at ao of higher than 3.

The site-specific Seismic Category I structures at the STP 3 and 4 sites, such as UHS Basin/RSW Pump House, are generally large structures with significant foundation footprint. For example, UHS Basin has a foundation footprint of approximately 275 ft x 140 ft. With an equivalent foundation radius of 110 ft, and assuming an average shear wave velocity of about 1000 ft/sec and a cut-off frequency of about 22Hz used in the SSI analysis, the corresponding ao value for this structure is calculated to be on the order of about 15 while the test problems are carried out to ao values less than 3. Because the shape of the response transfer functions are strongly dependent on the a_o value (e.g. as shown in Fig. 03.07.02-29 S1.6 provided with this response), the applicant is requested to extend the results of the above test problems in terms of the foundation response transfer functions (including both compliance and scattering functions) calculated using the subtraction method to a_o values up to at least 8. The inspection of the results is necessary to ensure the

accuracy and stability of the subtraction method used for analysis of large embedded structures. Theoretical closed-form solutions are available for comparison to a_o values of 6 to 8.

Issue 22: [Received 05/19/2011; New Action Item] DNFSB Issues Related to the SASSI Subtraction Method

The Defense Nuclear Facilities Safety Board (DNFSB) issued a letter on April 8th, 2011 requesting the Department of Energy (DOE) to address technical and software quality assurance issues related to potentially erroneous seismic analyses performed using the SASSI Subtraction method. SASSI subtraction method has been used for STP application for embedded structures. As such, the applicant is requested to review these concerns and assess the potential impact on STP's seismic analysis.