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Fifth Single-Shell Tank Integrity Project Expert Panel Meeting August 28-29, 2014

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Abstract: On August 28th and 29th, 2014 the Single-Shell Tank Integrity Project (SSTIP) Expert Panel (Panel) convened in Richland, Washington. This was the Panel's first meeting since 2011 and, as a result, was focused primarily on updating the Panel on progress in response to the past recommendations (Single-Shell Tank Integrity Expert Panel Report, RPP-RPT-45921, Rev 0, May 2010). This letter documents the Panel's discussions and feedback on Phase I activities and results.

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November 11, 2014

Mr. Daniel Baide
Washington River Protection Solutions, LLC
P.O. Box 1500, MSIN R3-26
Richland, Washington 99352

**SUBJECT: FIFTH SINGLE-SHELL TANK INTEGRITY PROJECT EXPERT
PANEL MEETING AUGUST 28-29, 2014.**

Dear Mr. Baide,

On August 28th and 29th, 2014 the Single-Shell Tank Integrity Project (SSTIP) Expert Panel (Panel) convened in Richland, Washington. This was the Panel's first meeting since 2011 and, as a result, was focused primarily on updating the Panel on progress in response to the past recommendations (*Single-Shell Tank Integrity Expert Panel Report*, RPP-RPT-45921, Rev 0, May 2010).

Based on Tri Party Agreement (TPA) Milestone M-45-91 and the Panel's recommendations, SSTIP activities were organized into two phases: Phase I to be completed by 2014 and Phase II to be developed based on the results of the Phase I activities. This meeting provided an opportunity for the Panel to review and respond to Phase I results. The Panel recommends an additional meeting be held once WRPS has developed options and/or proposals for its Phase II activities.

This letter documents the Panel's discussions and feedback on Phase I activities and results. The agenda for the meeting can be found in Attachment 1, an attendee list is found in Attachment 2 and the presentations from the meeting are found in TOC-PRES-14-3731-VA, Rev. 0, Single Shell Tank Integrity Project Expert Panel Meeting August 2014.

Single-Shell Tank Integrity Project Expert Panel Members

John Beavers • Don Camaioni • Steve Cullen • Russ Jones • Bob Kennedy • Scott Lillard
• Todd Martin • Leon Stock • Karthik Subramanian • Glenn Washer • Bruce Wiersma

General Panel Themes

The following themes arose during the Panel's discussions. These themes should not be considered formal recommendations at this point, but provide insight into topics the Panel hopes WRPS will consider in its planning for Phase II integrity approaches.

- **WRPS should ensure documents are updated and integrated across the SSTIP.** Phase I activities have resulted in the development of a large amount of information. The Analyses of Record efforts represent one example of an extensive effort that produced large amounts of important information that should be maintained, organized, and accessible. As new information is obtained, these 'living' documents should be updated comprehensively throughout the program.
- **WRPS should focus on approaches to removing water from, and preventing water intrusion into, the SSTs.** The Panel continues to be concerned with the amount of drainable water present in the SSTs. This water not only increases the potential for leaks, but also raises corrosion concerns through dilution of soluble corrosion inhibitors present in the waste. Accordingly, the Panel urges implementation of:
 - Approaches to prevent water intrusion into the SSTs such as tank farm covers (as the Panel recommended in its original Recommendation MCM-1) and sealing intrusion points.
 - Approaches to remove water from the SSTs such as improved pumping technologies and active ventilation.

An additional issue related to water intrusion arose during the Panel's discussions. Visual inspections revealed discoloration on several concrete SST domes that appears to indicate the paths water takes through or around risers to enter the SSTs. In concrete structures, such as bridges, water stains may be an indicator of corrosion damage. While in the early stages of considering this issue, the Panel intends to discuss this more thoroughly when considering recommendations for Phase II activities.

- **WRPS should further refine and standardize its visual inspection approach.** The Panel commends WRPS for its current SST visual inspection program, which is much improved compared to 2011 (when essentially no visual inspection of SSTs was occurring).

However, it is unlikely that the current approach supports the goal of identifying a flaw with a width of 1/16 inch. Refinement of this approach is needed. Further, it is difficult to compare images across tanks and timeframes due to differences in lighting, coloring, etc. As a result, WRPS should develop a calibration strategy for visual inspections. Such a strategy should standardize color interpretation, contrast, and resolution to provide a baseline for determining the size of a crack that can be identified.

- **WRPS should consider prioritizing SST visual inspections by risk analysis.** The Panel acknowledges the difficulties associated with the logistics of scheduling and performing work in the tank farms. However, given the current schedule of visually inspecting approximately twelve SSTs per year, significant time will pass between inspections in any individual tank. This time is sufficient for a problem (e.g. concrete degradation in the dome) to arise and manifest itself without detection. As a result, if visual inspection or historical analysis identifies a degradation concern in an SST, WRPS should consider prioritizing additional visual inspections in that SST.
- **WRPS should perform analysis of buckling of SST liners.** Phase I visual investigations and review of historic photos has revealed more extensive buckling of SST bottoms than was previously appreciated. The Panel is particularly interested in sharp radius buckling that could impact liner leak integrity.
- **WRPS should ensure integration of vadose zone and SSTIP activities.** The Panel understands that, due to the current organization and scope of contracts at Hanford, barriers exist to ensuring integration between vadose zone and SSTIP activities. However, the Panel reiterates the importance of such integration and requests additional information at the next meeting on the performance of tank farm covers, surface infiltration barriers, tank infrastructural leak controls, subsurface barrier evaluations, vadose zone monitoring data and reporting, and other vadose zone activities relative to the SSTIP.
- **WRPS should consider expediting the completion of remaining SST leak assessment analyses.** The Panel received a presentation that outlined the leak assessments that have been performed to date (TOC-PRES-14-3731-VA). The leak analyses are important for identifying potentially troublesome SSTs and the information obtained may impact Phase II SSTIP activities. It is the Panel's understanding that over 50 analyses remain to be performed and these will only be scheduled shortly before each respective SST is to be retrieved. As a result, some of the analyses may not take place for as many as 20 years.

Assessment of WRPS Responses to Panel Primary Recommendations

In general, the Panel is encouraged by the results of Phase I activities and is pleased with the responses to its recommendations. The Panel reviewed each of its primary recommendations and the corresponding WRPS Phase I activity. Below are the original recommendations (details of these recommendations can be found in RPP-RPT-43116) and the Panel's assessment based on Phase I activities and results.

Panel assessment of response to Recommendation SI-1, Perform Modern Structural Analyses: The project has successfully completed modern structural analyses for all SSTs. These analyses (RPP-RPT-49989, RPP-RPT-49990, RPP-RPT-49992, RPP-RPT-49991) have been reviewed and found acceptable by independent structural experts (including one Panel member). While no additional analyses are necessary, consideration should be given to modeling increasingly larger areas of degraded concrete to establish at

what point the degradation renders the tank no longer structurally sound. If WRPS chooses to perform such an analysis, it should only be completed for one of the SST types.

Panel assessment of response to Recommendation SI-2: Perform Dome Deflection Surveys: The project has continued to perform these surveys. The Panel suggests these surveys and their subsequent reporting focus on the difference in deflection between the dome center and haunch. Additionally, if other integrity activities (e.g. visual inspection) identify evidence of degradation, the project should consider increasing the frequency of surveys on specific SSTs.

Panel assessment of response to Recommendation SI-3: Obtain and Test Sidewall Core: WRPS has obtained a sidewall core from Tank 241-A-106 and results of the concrete tests are encouraging with the core demonstrating higher than expected concrete strength (see TOC-PRES-14-3731-VA).

The Panel is pleased with WRPS efforts on this recommendation. The Panel originally recommended two cores and remains supportive of obtaining an additional core. However, the Panel acknowledges the difficulty and cost of obtaining these cores. The Panel considers obtaining an additional sidewall core sample a higher priority than the additional concrete degradation analysis discussed above under Recommendation SI-1.

Panel assessment of response to Recommendation SI-4: Perform Nondestructive Evaluation of Concrete: As is discussed earlier in the Panel General Themes section, WRPS has been responsive to this recommendation by performing visual inspections. WRPS should improve its visual inspections by developing a calibration strategy (crack width identification, standardizing color interpretation, etc.).

Additionally, WRPS performed a sonic echo test during the sidewall core drilling. The Panel recommends WRPS reanalyze the sonic echo test data, particularly in light of the sidewall core results, to inform future testing.

Panel assessment of response to Recommendation LD-1: Expand Leak Assessment Reports: WRPS has been responsive to this recommendation and the Leak Assessment Reports to date have been comprehensive and insightful. As is mentioned in the Panel General Themes section, WRPS should consider expediting the remaining SST assessments.

Panel assessment of response to Recommendation LD-2: Avoid inadvertent addition of water and chloride to SSTs: WRPS has clearly avoided the addition of chloride. As is mentioned above, additional information on water intrusion has been obtained and is concerning to the Panel.

Panel assessment of response to Recommendation LIP-1: Continue Leak Detection Monitoring and Best Management Practices and Install Enhanced SST Monitoring:

This recommendation remains important, particularly given that significant drainable liquid remains in SSTs and intrusion is adding water to some SSTs. WRPS has enhanced its visual inspection capabilities and been more aggressive in reviewing historical information on leaking or potentially leaking SSTs. Lastly, monitoring associated with the T Farm Interim Cover has demonstrated its effectiveness and such covers should be considered for additional tank farms.

Panel assessment of response to Recommendation LIP-2: Avoid the Addition of Water-Insoluble Absorbents to SSTs: WRPS has been responsive to this recommendation as such absorbents have not been added to SSTs.

Panel assessment of response to Recommendation LIP-3: Continue Use of High Resolution Resistivity: WRPS has been responsive to this recommendation as this technology is still utilized during retrieval.

Panel assessment of response to Recommendation MCM-1: Install Surface Barrier Over SST Farms: The Panel did not receive any detailed presentations on this specific topic at this meeting. Further consideration of this topic should be included in the Panel's next meeting agenda. As is stated elsewhere in this report, tank farm barriers to minimize infiltration should be considered for additional tank farms.

Assessment of WRPS Responses to Panel Secondary Recommendations

In addition to the Panel's primary recommendations, WRPS has made progress on several secondary recommendations that are worth noting. Recommendations LD-3 (Examine "Non-Compliant" wastes at 25 °C), LD-5 (Determine Ammonia Corrosion Control Concentration), and LD-6 (Assess SST Waste Compositional Variation) were discussed at the meeting.

In response to Recommendation LD-3, progress has been made through laboratory work assessing the corrosive properties of representative non-compliant, incompletely inhibited wastes. On balance, the results indicate that non-compliant wastes in the SSTs are not susceptible to SCC at lower storage temperatures. Some of the tested chemistries exhibited propensities for localized corrosion and additional work is planned to understand the behavior.

Recommendation LD-5 work is based on Double Shell Tank (DST) waste scoping investigations that demonstrated ammonia acts as a corrosion inhibitor. WRPS plans to continue this work on selected SST wastes with targeted investigations in FY 2015.

Recommendation LD-6 focused on analyzing and reporting common factors for SST liners that have failed. The Panel discussed a portion of this recommendation in the General Panel Themes above, noting the importance of completing such analysis and reporting for the remaining 50 SSTs. Clear common factors have not emerged for the 25 SSTs that have undergone this analysis. However, useful SST history information and its relationship to the risk of liner failure have been gained. Utilizing similar information, a

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risk ranking effort was undertaken for the DST integrity program (see RPP-PLAN-57352) to rank the DSTs most likely to leak in the future. WRPS should consider utilizing the common factors work in a similar fashion for the SSTIP.

The Panel commends WRPS for its SST integrity programmatic efforts and looks forward to assisting with the development of Phase II activities.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd Martin", with a stylized flourish at the end.

Todd Martin
Single-Shell Tank Integrity
Project Expert Panel Chair

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Attachment 1: SSTIP Expert Panel Meeting Agenda

SINGLE SHELL TANK INTEGRITY PROJECT EXPERT PANEL MEETING

Dates and Times: Thursday, August 28, 2014 from 8:00 am to 5:00 pm
Friday, August 29, 2014 from 8:00 am to 12:00 pm

Where: Pacific Northwest National Laboratory
Computational Sciences Facility (CSF)
Darwin Room #1007
Richland, Washington

Panel Members: Don Camaioni
Steve Cullen
Russ Jones
Bob Kennedy
Scott Lillard
Todd Martin
Leon Stock
Karthik Subramanian
Glenn Washer
Bruce Wiersma

Attire: Business Casual

Thursday August 28th, 2014

8:00 am - 8:20 am	Welcome and Opening Remarks	Walt Isom, Jeremy Johnson, Jeff Lyon
8:20 am – 8:30 am	Introductions and Agenda Overview	Todd Martin
8:30 am – 8:45 am	Review of SSTIP status	Todd Martin
8:45 am – 9:15 am	Overview of SSTIP formation, recommendations and activities	Ted Venetz
9:15 am – 10:00 am	Leak cause, location and rate analyses	Crystal Girardot
10:00 am – 10:15 am	Break	

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Thursday, August 28, 2014

10:15 am – 10:45 am	Common Factors and Failure Analyses	Alan Carlson
10:45 am – 11:15 am	Single-Shell Tank Corrosion Testing	Amie Feero
11:15 am – 11:30 am	Leak Integrity Re-cap	Ted Venetz
11:30 am – 1:00 pm	Lunch	
1:00 pm – 1:45 pm	SST Sidewall Coring Project Overview	Tom Misiak
1:45 pm – 2:00 pm	241-C-107 Dome Plug Results – Concrete and Rebar	Tom Misiak
2:00 pm – 2:15 pm	Break	
2:15 pm – 2:30 pm	SST Dome Survey	Tom Misiak
2:30 pm – 3:00 pm	Single Shell Tank Analyses of Record	Ken Johnson
3:00 pm – 5:00 pm	Panel Executive Session	Todd Martin

Friday, August 29, 2014

8:00 am – 8:30 am	Single Shell Tank Visual Inspections	Amie Feero
8:30 am – 9:00 am	Single Shell Tank Waste Level Change	Amie Feero
9:00 am - 9:30 am	Single Shell Tank Integrity Project Path Forward	Ted Venetz
9:30 am - 9:45 am	Break	
9:45 am – 11:30 am	Panel Executive Session	Todd Martin
11:30 am – 12:00 pm	Panel Outbrief	
12:00 pm	Adjourn	

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Attachment 2: SSTIP Expert Panel Meeting Attendees

Alex Nazarali, CTUIR	Russ Jones, GT-Engineering	Glenn Washer, U. of Missouri
Steve Cullen, DB Stephens and Associates	Stan Sobczyk, NPT-ERWM	Kayle Boomer, WRPS
		Alan Carlson, WRPS
Bob Rosen, DNFSB	Dirk Dunning, Oregon	Amie Feero, WRPS
		John Garfield, TAPI
John Beavers, DNV GL	Don Camaioni, PNNL	Crystal Girardot, WRPS
		Jason Gunter, WRPS
Jim Alzheimer, Ecology	Bob Kennedy, RPK Structural Mechanical Consultants	Thomas A. Misiak, WRPS
		Ted Venetz, WRPS
Jeff Larson, G.A.O.	Leon Stock (by phone)	
		Todd Martin, Panel Chair