STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Richland Field Office
3100 Port of Benton Blvd., Richland, WA 99354 • 509-372-7950

December 19, 2024 24-NWP-224

Ricky Bang, Deputy Assistant Manager
Tank Farms Division
Hanford Field Office
United States Department of Energy
PO Box 550
Richland, Washington 99352

Re: Transmittal of the Department of Ecology's Comments for the *Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation*, RPP-RPT-64595, Revision 0

References: See page 2

Dear Ricky Bang:

The Department of Ecology is transmitting comments for the *Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation*, RPP-RPT-64595, Revision 0 (Reference 1). Ecology reviewed RPP-RPT-64595 in accordance with the requirements of Agreed Order 21304 V.F.1.iii.

Ecology needed additional time to complete our review and transmitted letters regarding our continued review of RPP-RPT-64595. Ecology stated we would provide the United States Department of Energy (USDOE) with our comments by December 20, 2024 (References 2 and 3).

Ecology anticipates an updated document and USDOE comment responses within 30 days of receipt of this letter. We appreciate your review of these comments and look forward to meeting with you to resolve comment responses.

If you have any questions or concerns, contact Eric Pierce, Permit Lead, at (509) 410-5273 or eric.pierce@ecy.wa.gov or Jeff Lyon, Project Manager, at (509) 539-1996 or jeff.lyon@ecy.wa.gov.

Sincerely,

Digitally signed by
Lyon, Jeffery (ECY)
Date: 2024.12.19
13:57:27 -08'00'

Jeffery J. Lyon
Tank Systems Operation & Closure Project Manager
Nuclear Waste Program

ep/mo
Enclosure

cc: See page 2

References:

1. Letter 24-TWO-0091, dated August 8, 2024, “Submittal of RPP-RPT-64595, ‘Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation,’ Revision 0”
2. Letter 24-NWP-177, dated September 19, 2024, “Extension of the Department of Ecology’s Comment Review Period for the *Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation*, RPP-RPT-64595, Revision 0”
3. Letter 24-NWP-206, dated November 8, 2024, “Additional Extension of the Department of Ecology’s Comment Review Period for the *Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation*, RPP-RPT-64595, Revision 0”

cc electronic:

Dave Einan, EPA
Delmar Noyes USDOE
Jon Perry, HMIS
Michael Turner, HMIS
Thomas Beam, WRPS
Jim Field, WRPS
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Beth Rochette, Ecology
Jonathan Rogers, Ecology
Stephanie Schleif, Ecology
Environmental Portal
Hanford Administrative Record
Hanford Facility Operating Record
HAB Correspondence Control
HMIS Correspondence Control
USDOE Correspondence Control
WRPS Correspondence Control

Review Comment Record	Washington State Department of Ecology Nuclear Waste Program	Date: 10/31/2024 Page 1 of 8

Document Title(s)/Number(s): RPP-RPT-64595, *"Single-Shell Tank Leak Detection and Monitoring Technologies Evaluation," Rev 0*

Document Manager	Telephone Number	Project Manager	Telephone Number	Facility Site ID	Cleanup Site ID
Eric Pierce	(509)-410-5273	Jeff Lyon	(509)539-1996		

Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	Modification Needed	Basis/Justification	Permittee Response	Ecology Response	Open/Close	Reviewer Initials
1	General	Document cites "A recent Agreed Order (AO 21304) between the US DOE and the Washington State Department of Ecology states that, "the installation of new leak detection and monitoring technology could be beneficial in identifying fate and transport of liquid waste released from SSTs with active leaks if the instrumentation is sensitive enough to monitor the tank leakage rate." Document further emphasizes that "Any in-tank or ex-tank LDM technology can be improved by using more detectors at more locations with more frequent data collection and data evaluations and integrating in-tank and ex-tank data." Although ex-tank technology including (1) Dry Well logging with neutron probe and Gamma detector and (2) Electrical Resistivity (ER) are promoted as best for ex-tank leak detection particularly performed on a frequent basis, the report does not recommend implementing these on a frequent/regular basis for leak detection. Bay West Report states that the use of improved deployment technologies that facilitate monitoring for leaks closer to the SST base (i.e., volume of interest) were identified that may detect marginally smaller leak volumes or rates and provide improved LDM of SSTs. Given the age of the SSTs and their continued use for the foreseeable future beyond their 25-year design life, implementing a proven and viable ex-tank leak detection monitoring technology is an improved method of leak detection compared to not performing the monitoring until a suspected leak is confirmed by in-tank volume assessments (which is current practice when not in retrieval process).	Technologies addressed in the report for ex-tank leak detection are only good if applied and routinely/frequently implemented. Although routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys were initially implemented their use has been decreasing in frequency and ultimately stopped except for tank recovery operation monitoring. Without continued routine monitoring it is impossible to determine if there are any changes in the subsurface soils that would suggest/indicate releases from the SSTs. Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why renewed routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.	AO 21304 V.F.1.iii				CDG
2	General	Report and Attachment 1 - Bay West Report BWJ221104 refer to RPP-9937, Rev 05D SST System Leak Detection and Monitoring Functions and Requirements Document for prior and current leak detection monitoring technologies and	Report needs to enhance the assessment of ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) and include as a proven and viable method for leak detection monitoring.	AO 21304 V.F.1.iii				CDG

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		processes; however, procedures specified in RPP-9937 are to document the leak detection, monitoring, and initial actions required applicable during the SST pre-retrieval and post-retrieval of SST's and not regular routine ex-tank monitoring. There is no current routine ex-tank leak detection monitoring except during retrieval processes, as such making considerations and/or recommendations for technology improvements for leak monitoring without actual implementation of monitoring does not meet the intent of the required study. Simple technology source identification is not sufficient if even the historic dry well logging and electrical resistivity surveys which have proven successful are not even implemented anymore. Implementing a technology is an improved method of leak detection compared to not performing the monitoring.						
3	General Comment.	The DOE should consider the use of resistivity around the tank farms as a monitoring procedure, by including an analysis of drywell locations to monitor an entire tank farm. Routine monitoring for potential leaks in the tank farms would have the benefit of a baseline comparison during tank retrieval processes (for which the drainable liquid level is constantly changing).	Provide a justification for why routine monitoring using resistivity would not be considered an enhancement to the current tank farm leak detection and monitoring systems.	AO 21304 V.F.1.iii				JAR
4	Page xi Scientific Nomenclature	Scientific Nomenclature provides term identifiers and their definitions as well as correspondence to "L" however "L" by itself is not defined. "L_e" and L_s" are defined but not "L".	Provide definition for "L".	Clarification of term.				CDG
5	Sec. 1.0, Pg. 4, Para 4	Text uses terms "incremental (or marginal)" and "order of magnitude". Nowhere in the agreed order are these given as standards for use in determining practicability.	Remove references to "order of magnitude improvement" as a standard measure in determining practicability.	AO 21304 V.F.1.iii				WKH
6	Sec. 1.0, Pg. 4, Para 4	In a paragraph describing results from the subcontractor is a sentence that includes "it is not technically or economically practicable to enhance current LDM technologies used at Hanford or to deploy new technologies." No where does the	Remove references to practicability without performing a true evaluation.	AO 21304 V.F.1.iii				WKH

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		subcontractor make this claim. To the contrary, in Section 6.1, page 80 it is stated: "economic practicability was not evaluated as part of this evaluation" and ER is inferred as practicable with enhancements (Sec. 2.6, pg. 33, Table 2-8 Attachment 1, Page ES-4, Table ES-2).						
7	Sec. 2.0, Pg 5, Para i.	The purpose of the technology evaluation includes applications "to determine conditions, nature, location, and extent of any leakage". Determining nature and extent of the leaks seems to have fallen out of consideration of the technologies. ER is cited as capable of providing such information (pg. 33, Table 2-8).	Include a discussion of potential to monitor active leaks using ER and improvements possible with additional sensors/electrodes and software in the system.	AO 21304 V.F.1.iii				WKH
5	Section 3.3, Pg. 8, 3rd paragraph, 2nd sentence.	The text reads: "However, it was determined that adding more detectors at more locations would result in marginal improvements as compared to the performance of LDM technologies and methods currently used at Hanford." The technologies used at the Hanford Single-Shell Tanks are majority used during tank retrievals. There is a need for more routine monitoring to be conducted, and this could be done with the addition of more detectors at more locations.	Please explain why the implementation of marginal improvements to current LDM (and leak rate and fate transport) are not being considered or are excluded from the report.	AO 21304 V.F.1.iii				JAR
6	Section 3.3, Pg. 9, Table 3-1 "Potential Methods to Enhance Current Hanford Technologies"	The table describes enhancement methods for dry well logging with neutron probes and gamma detectors. Routine monitoring using dry well logging (with neutron probes and gamma detectors) could serve a use as a baseline comparison when used for retrievals – would it not be considered an enhancement to use this technique routinely as opposed to only during active retrievals, as is current practice?	Please explain why the enhancement method marked in Table 3-1 for dry well logging is not used outside of active retrieval.	AO 21304 V.F.1.iii				JAR
7	Section 3.3, Pg. 9, Table 3-1 "Potential Methods to Enhance Current	The table describes enhancement methods for electrical resistivity (ER). Modeling to design a system for enhancing ER surveys and data acquisition would be beneficial to monitoring tank leaks – is the DOE or contractor	Please explain why the enhancement method marked in Table 3-1 for ER is not being implemented universally in the SST system.	AO 21304 V.F.1.iii				JAR

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	Hanford Technologies"	considering any modeling efforts to design an improved system for ER?						
8	Section 6.1.2, Page 15, 2nd Paragraph	Text reads "Dry well logging potential enhancements and/or improvements identified were: • Automate and/or increase monitoring frequency and, • Add monitoring locations (direct push wells and sensors)." However, implementation of the technology at routine/frequent intervals for leak detection is not recommended in the report. Technologies addressed in the report for ex-tank leak detection are only good if applied and routinely/frequently implemented.	This is a very important aspect of ex-tank leak detection monitoring not currently implemented on a routine basis for leak detection. Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why renewed routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys is not is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.	AO 21304 V.F.1.iii				CDG
9	Section 6.1.2, Page 15, 3rd Paragraph	Text reads "Potential enhancements and/or improvements to past electrical resistivity surveys at Hanford were: • Increase number of ER sensors and electrodes, • More sensors, sensor locations closer to tanks, and frequent monitoring • improve the sensitivity of leak detection; and, • Perform ER/Surface Geophysical Exploration (SGE) across an entire tank farm." Again, implementation of the technology at routine/frequent intervals for leak detection is not recommended in the report. This is a very important aspect of ex-tank leak detection monitoring not currently implemented on a routine basis for leak detection. Technologies addressed in the report for ex-tank leak detection are only good if applied and routinely/frequently implemented.	Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why renewed routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.	AO 21304 V.F.1.iii				CDG
10	Sec. 6.2, Pg. 16, Para 2 & 4	Para 2: "A detailed cost/benefit analysis is not realistic unless further refinement and selection has been made to…" Para 4: "Therefore, it is not technically or economically practicable to enhance current LDM	Remove references to economic and technical practicability that are made without adequate, or any, support elsewhere in the text.	AO 21304 V.F.1.iii				WKH

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		technologies used at Hanford or to deploy new technologies, and no additional LDM studies or improvements are identified." These two statements are incongruous.						
11	Section 6.2, Pg. 16, 4th paragraph.	The text says "therefore, it is not technically or economically practicable to enhance current LDM technologies used at Hanford or to deploy new technologies, and no additional LDM studies or improvements are identified." However, in the previous paragraph (Pg. 15, Section 6.2, second paragraph), the text states "[it] is apparent that reliable cost estimates and potential incremental improvements could not be quantified without further development and design specific to the Hanford Tank Farms." It would seem that this suggests that a study can be identified to improve the potential for technology enhancement/implementation of new technology…by conducting a study specifically around the Hanford Site SSTs.	Please explain why permittees will not conduct a design specific to this type of work in the SSTs.	AO 21304 V.F.1.iii				JAR
12	Page 16 Section 6.2 Last Paragraph	Text reads "Therefore, it is not technically or economically practicable to enhance current LDM technologies used at Hanford or to deploy new technologies, and no additional LDM studies or improvements are identified." This is a very important aspect of ex-tank leak detection monitoring not currently implemented on a routine basis for leak detection. Without continued routine monitoring it is impossible to determine if there are any changes in the subsurface soils that would suggest/indicate releases from the SSTs.	Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification, such as cost estimates and technology implementation constraints prohibiting deployment, why renewed routine ex-tank leak detection monitoring using dry well logging and/or electrical resistivity surveys is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.	AO 21304 V.F.1.iii				CDG
13	Page 68 Section 5.4 First Paragraph	The text reads: "As noted previously, none of the new technologies or methods reviewed appear to be capable of providing an order of magnitude improvement to current LDM and characterization methods, while the amount of incremental	Ecology recommends additional testing and review of methodology as necessary before determining the magnitude of improvement.	AO 21304 V.F.1.iii				MM

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		improvement possible will vary depending on how the technologies are installed and operated and how the data is evaluated."						
14	Page 73 Section 5.5.3 Last Paragraph	The text reads: "Ex-tank monitoring is not currently required for SSTs in storage mode."	Ecology recommends ex-tank monitoring as a routine task to ensure there is no chance of a release from tanks in storage. .	AO 21304 V.F.1.iii				MM
15	Attachment 1 - Bay West Report BWJ221104 Page ES-1 Executive Summary 3rd Paragraph	Text reads "However, the use of improved deployment technologies that facilitate monitoring for leaks closer to the SST base (i.e., volume of interest) were identified that may detect marginally smaller leak volumes or rates and provide improved LDM of SSTs." Document addresses "improved deployment techniques" which includes performing routine vadose zone monitoring, which has not been performed since around 2005. Implementing a technology is an improved method of leak detection compared to not performing the monitoring (which is current practice).	Ecology has two items: 1) Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification, such as cost estimates and technology implementation constraints prohibiting deployment, why renewed routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys is not practicable or implementable as part of the "leak detection and monitoring technology" assessment. 2) Discuss incremental/marginal improvements as legitimate goals to meet requirements of AO.	AO 21304 V.F.1.iii				CDG WKH
16	Attachment 1, Page ES-4, Table ES-2, & Page ES-7, Para 2	The report can be read as a down-selection of electrical resistivity for additional evaluation. ER is cited throughout as existing and effective for leak detection and confirmation. Enhancements in LDM using ER can be made with more electrodes (Table ES-2). "Modeling, testing and/or cost/benefit studies would be needed to confirm and quantify the incremental improvements and further refine the estimated costs." (ES-7, para 2)	Perform a thorough and defensible technical and economic practicability evaluation for enhancing the ER network throughout the tank farms.	AO 21304 V.F.1.iii				WKH
17	Attachment 1 - Bay West Report BWJ221104 Page 5-6 Last paragraph Page 5 continuing number items on Page 6	Technologies evaluated must address one or more of three basic functions: 1. **Leak Detection**: A technology that allows continuous or frequent measurement of some parameter and can detect changes which may be indicative of a tank leak. 2. **Leak Monitoring**: A technology that can evaluate the anomaly detected by the leak	Report should emphasis the actual implementation of ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why renewed routine ex-tank leak detection monitoring using dry well logging and	AO 21304 V.F.1.iii				CDG

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		detection method, confirm that it is in fact a tank leak, and/or provide some indication. of the leak volume and changes in the leak rate. 3. **Leak Tracking**: A technology that can provide detailed data, which can be used to determine the extent of an active tank leak, and track migration of the leak in the vadose zone. Document promotes "leak monitoring" and "leak tracking" which can only occur if routine vadose zone monitoring is actually performed. Routine monitoring has not been performed since around 2005. Recommending/Implementing a technology is an improved method of leak detection compared to not performing the monitoring (which is current practice).	electrical resistivity surveys is not is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.					
18	Attachment 1 - Bay West Report BWJ221104 Section 2.6 Table 2-8	Table is titled "Potential Methods to Enhance Current Ex-Tank Hanford Technologies" and promotes "enhanced deployment" of dry well logging and electrical resistivity surveys. However, although the summary identifies "expansion of devices" it fails to promote reestablishing routine/frequent implementation of these technologies for leak detection. Document addresses "potential methods to enhance current monitoring techniques" but does not clearly recommend reactivation/performing routine vadose zone monitoring, which has not been performed since around 2005. Implementing a technology is an improved/enhanced method of leak detection compared to not performing the monitoring (which is current practice).	Report needs to include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) at each tank farm as a proven and viable method for leak detection monitoring or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why renewed routine ex-tank leak detection monitoring using dry well logging and electrical resistivity surveys is not is not practicable or implementable as part of the "leak detection and monitoring technology" assessment.	AO 21304 V.F.1.iii				CDG
19	Attachment 1 - Bay West Report BWJ221104 Page D-13 & D-14	Report references that HGI has been involved in application of HRR to SST leak detection at Hanford for about 20 years. Over that time, they have been involved in ex-tank monitoring for 15 tanks during retrieval operations. The current HRR-LDM system has shown the ability to detect a leak of 2100 gallons within 24 hours at a 95%	Include ex-tank monitoring (neutron probe logging of dry wells and high-resolution resistivity surveys) as a recommendation for each tank farm or provide clear justification (cost estimates and technology implementation constraints prohibiting deployment) why implementation of routine ex-tank leak detection monitoring is not practicable.	AO 21304 V.F.1.iii				CDG

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		confidence level, and a leak of 1000 gallons with a 50% confidence level. Report further states resistivity measurements represent the best chance of detecting highly alkaline conductive liquid associated with a tank leak. Other methods such as drywell gamma or neutron moisture logging can only detect leaks when the liquid is close to the drywell. HRR and drywell gamma or neutron moisture logging has been a proven effective method for subsurface soil investigations for assessment of contaminants from tank releases and must be addressed as a viable leak detection monitoring technique to be implemented at all tank farms.						