



U.S. Department of Energy

0059703

**Office of River Protection**

P.O. Box 450  
Richland, Washington 99352

JUN 11 2003

03-ED-094

Mr. E. S. Aromi, President  
and General Manager  
CH2M HILL Hanford Group, Inc.  
Richland, Washington 99352

**RECEIVED**  
JUN 19 2003

**EDMC**

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – TRANSMITTAL OF REGULATORY LETTER:  
S-112 FULL SCALE LEAK DETECTION, MITIGATION, AND MONITORING (LDMM),  
HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (HFFACO)  
MILESTONE M-45-03C; S-112/C-104 FUNCTIONS AND REQUIREMENTS (F&R)  
CONDITIONAL APPROVAL LETTER HFFACO MILESTONES M-45-03-T03 AND  
M-45-03-T04; AND S-102 F&R LDMM COMMENTS/RESPONSES, HFFACO MILESTONE  
M-45-05-T16

Attached please find the letter from J. J. Lyon, State of Washington Department of Ecology, to  
J. E. Rasmussen, U.S. Department of Energy, Office of River Protection (ORP), dated June 2,  
2003. In accordance with Clauses H.25 and H.26 of the Contract, CHG is requested to evaluate  
the required actions and prepare a response to the letter. Please advise ORP in writing within  
30 days of this letter of any impacts to scope, cost, or schedule that were not included in the  
current baseline.

If you have any questions, please contact me, or you may contact Ro Vinson, Project  
Enhancement Corporation, (509) 376-5455.

Sincerely,

Judith S. O'Connor  
Contracting Officer

ED:JER

Attachment

cc w/attach:

W. T. Dixon, CHG

J. A. Diediker, INFO

J. L. Hanson, INNOV

Administrative Record

**Attachment  
03-ED-094**

**Ecology Letter from J. J. Lyon to J. E. Rasmussen, ORP,  
“S-112 Full Scale Leak Detection, Mitigation, and Monitoring  
(LDMM), Hanford Federal Facility Agreement and Consent Order  
(HFFACO) Milestone M-45-03C; S-112/C-104 Functions and  
Requirements (F&R) Conditional Approval Letter HFFACO  
Milestones M-45-03-T03 and M-45-03-T04; and S-102 F&R  
LDMM Comments/Responses, HFFACO Milestone  
M-45-05-T16,” dated June 2, 2003**

59671



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

1315 W. 4th Avenue • Kennewick, Washington 99336-6018 • (509) 735-7581

June 2, 2003

Mr. James Rasmussen  
Environmental Management Division  
Office of River Protection  
United States Department of Energy  
P.O. Box 450, MSIN: H6-60  
Richland, Washington 99352

Dear Mr. Rasmussen:

Re: S-112 Full Scale Leak Detection, Mitigation, and Monitoring (LDMM), Hanford Federal Facility Agreement and Consent Order (HFFACO) Milestone M-45-03C; S-112/C-104 Functions and Requirements (F&R) Conditional Approval Letter HFFACO Milestones M-45-03-T03 and M-45-03-T04); and S-102 Functions and Requirements (F&R) LDMM comments/responses, HFFACO Milestone M-45-05-T16

The Washington State Department of Ecology (Ecology) is issuing this letter for the following purposes:

- 1) To address outstanding LDMM Review Comment Record (RCR) issues and conditions for S-112,
- 2) To address outstanding LDMM RCR issues for S-102,
- 3) To clarify leak LDMM expectations for other Single Shell Tanks (SST) scheduled for retrieval in the near future.

Ecology views the capabilities of proposed baseline LDMM to be unacceptable as described in the following documents supporting planned/proposed retrievals for SSTs:

- RPP-7825, Rev 0, December 2001, S-112 F&R
- RPP-10901, Rev 0, August 2002, S-102 F&R
- RPP-10413, Rev 0, February 2003, S-112 LDMM Strategy

RECEIVED  
JUN 05 2003  
DOE-ORP/ORPCG

Mr. James Rasmussen  
June 2, 2003  
Page 2

The ex-tank and/or in-tank LDMM baseline systems described in the above listed documents have a low probability of detecting/monitoring a leak during waste retrieval in a reasonable time frame. After reviewing all documentation available to date, Ecology has determined that LDMM baselines planned for S-112 and S-102 are not viable.

HFFACO milestone M-45-03C (for S-112) states "Demonstration shall also include the installation and implementation of full scale leak detection, monitoring, and mitigation (LDMM) technologies." As previously indicated in the July 19, 2002, letter to the United States Department of Energy (USDOE) following the C-104 and S-112 F&R comment/response resolution process, approval of F&R documents is conditional. The following conditions from the July 19, 2002 letter are related to LDMM:

- #3. Ecology understands that Office of River Protection (ORP) is currently planning field testing ex-tank LDMM technologies and plans to deploy an ex-tank technology at S-112 and then at C-104, if the technologies prove to add value. Ecology requires that ORP maintain design flexibility to incorporate at least one viable ex-tank LDMM technology for each retrieval. Ecology expects that ORP will continue to seek out and invest in technology to improve the capability to detect and mitigate leaks during retrieval.
- #5. Ecology does not accept or approve the suggested allowable leak volume of 36,000 gallons. Ecology is concerned that the results of the screening level risk assessment for C-104 may lead to the belief that an allowable leak volume of 36,000 gallons is acceptable. USDOE should make reasonable efforts to prevent leaks of any kind, regardless of what the risk assessment results show as acceptable. Ecology expects that USDOE will continue to develop and implement technology to improve on the 19,000 gallon detection limit specified for C-104 and the 8,000 gallon detection limit specified for S-112, both of which are based on in-tank/in-line methodology. Ecology's position is that leak detection should be based on the limits of best available technology, not risk.

Ecology has reviewed the following reports related to ex-tank electrical resistivity leak detection technologies:

- PNNL-14192, March 2003, Results of Tank-Leak Detection Demonstration Using Geophysical Techniques at the Hanford Mock Tank Site – Fiscal Year 2002.
- RPP-14606, Rev 0, March 2003, Performance Assessment of HRR-SCRT, ERT-PET, and ERT-LET Resistivity Ex-Tank Leak Detection Methods – Fiscal Year 2002-2003.
- RPP- 15449, Rev 0, March 2003, White Paper- Ex-Tank Resistivity LDM Performance Testing and Strategy for Single-Shell Tank Deployment Demonstration.

Mr. James Rasmussen  
June 2, 2003  
Page 3

Ecology participated in the LDMM down-selection workshop conducted January 29-30, 2002, and toured the test site several times. Ecology has also researched additional information/reports related to this and other LDMM technologies.

For tanks where at least several thousand gallons of liquid are being added during retrieval and/or tanks containing at least several thousand gallons of liquid waste prior to retrieval, LDMM objectives must include but are not limited to the following:

- 1) The leak detection system should be capable of detecting relatively small leaks (2,000 gallons or less) with at least a 95% probability of detection and a maximum 5% probability of positive false alarms.
- 2) Leaks are to be detected in a timely manner; i.e., within 24 hours of the escape of liquids from containment.
- 3) Leak volumes and leak rates must be reasonably calculated to the extent possible, in a timely manner.
- 4) Data can be rapidly reduced to provide results allowing for timely retrieval/closure action decisions by site owners/operators and regulators.
- 5) Leak detection and monitoring systems should interrogate the entire environment surrounding an SST (not simply selected sample points) and should have the potential to assess impacts from a leak within the operating system.
- 6) Leak detection and monitoring should track the lateral and vertical movement of any leak within the above criteria.
- 7) Leak detection methods should be based on the best available technology applicable to the tank waste type and retrieval method.

The above referenced reports conclude that electrical resistivity methods for leak detection exhibit great potential for application in tank farms and should provide far superior detection capabilities than the current baseline of drywell monitoring. Of the various electrical resistivity methods analyzed, two were recommended for installation and testing at tank farms; high resolution resistivity-steel casing resistivity technology (HRR-SCRT) methods A and C, and electrical resistance tomography-long electrode technology (ERT-LET). The reports indicate problems with the ability of the baseline drywell monitoring to adequately detect leaks with reasonable confidence. The baseline plan for use of neutron and gamma detectors is limited to the number and specific locations of existing drywells and a small detection radius around each well; therefore, there is a high probability that tank leaks could go undetected. For instance, a typical SST has approximately a 235 foot circumference. Using neutron and/or gamma detectors, each drywell has a 3 foot radius of detection and would likely only provide coverage for limited areas. Significant areas toward the center of the tank and many areas along the tank edge have questionable or no leak detection coverage using the baseline method.

By comparison, electrical resistivity techniques interrogate the entire environment surrounding a tank and should detect leaks quickly, allowing for timely tank retrieval decisions by site

Mr. James Rasmussen

June 2, 2003

Page 4

owners/operators and regulators. In addition, the electrical resistivity detection methods would provide far more information on the final tank end state following retrieval compared to the proposed baseline monitoring. This would be very useful, if not essential, in validating post retrieval tank condition assumptions.

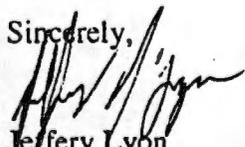
The current baseline method of using drywells to detect leaks has not undergone actual field testing/verification to meet retrieval LDMM objectives, and has significant limitations as noted above. The current baseline also does not provide adequate ability to document the performance of different retrieval methods in relation to tank leaks. Some information exists regarding detection of specific radioactive spectra in drywells; however, that data is not equivalent to actual field testing during tank retrievals. Electrical resistivity methods have undergone extensive field testing at the mock tank site and have performed well over an extended period of time. Ex-tank (baseline) drywell neutron/gamma logging, together with electrical resistivity leak detection methods, must be utilized as complimentary systems.

Ecology requires USDOE to select at least one ex-tank electrical resistivity method recommended in RPP-14606 and conduct credible demonstrations of the method(s) during the S-112 and S-102 SST retrieval campaigns. USDOE is further required to provide Ecology a detailed basis of USDOE's selection regarding the selected ex-tank electrical resistivity method(s) prior to start of retrieval operations. Following retrieval, Ecology also requires USDOE to submit a report documenting/analyzing the performance of all LDMM methods employed during the S-112 and S-102 retrieval projects. This analysis must be acceptable to Ecology. If other SST retrievals are scheduled prior to completion of the S-112 and S-102 LDMM evaluation, Ecology may require that ex-tank electrical resistivity methods, described above, be employed for those tanks as well.

Ecology recognizes that, depending on the waste type and specific details relating to retrieval method, certain SSTs destined for "dry" retrievals may be subject to alternative LDMM requirements. This concept would, in part, depend on quality data gathered from a sufficient number of ex-tank electrical resistivity LDMM deployments in the SST system. Ecology will address LDMM requirements on an individual tank by tank basis.

If you have any questions please contact Jeff Lyon at (509) 736-3098 or Dick Heggen at (509) 736-5716.

Sincerely,



Jeffery Lyon  
Tank Waste Storage Manager  
Nuclear Waste Program

cc: (see next page)

Mr. James Rasmussen

June 2, 2003

Page 5

cc: Robert Lober, ORP  
Andrew Stevens, ORP  
James F. Thompson, ORP  
Roger Bauer, CHG  
Keith Carpenter, CHG  
Todd Martin, HAB  
Rick Gay, CTUIR  
Stuart Harris, CTUIR  
Pat Sobotta, NPT  
Russell Jim, YN  
Ken Niles, OOE  
Administrative Record: M45-SST Retrieval