



Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JUL 17 2009

145643

09-SED-0153

Mr. C. G. Spencer, President
Washington Closure Hanford LLC
2620 Fermi Avenue
Richland, Washington 99354

Dear Mr. Spencer:

CONTRACT NO. DE-AC06-05RL14655 – APPROVAL OF REVISION 1 TO THE 618-10 AND 618-11 WASTE BURIAL GROUNDS BASIS FOR INTERIM OPERATION AND TECHNICAL SAFETY REQUIREMENTS DOCUMENTS

The purpose of this letter is to respond to the March 4, 2009, (143330) letter requesting review and approval of the Waste Burial Grounds Basis for Interim Operation, WCH-183, Revision 1, Decisional Draft, and the associated Technical Safety Requirements, WCH-184, Revision 1, Decisional Draft. The submitted safety documents have been reviewed and are approved with no Conditions of Approval. However, for the 618-11 Burial Site, approved activities are limited to non-intrusive activities as described in section 2.4.3.1 of WCH-183, Rev. 1. Intrusive activities within the 618-11 Burial Site are specifically prohibited. The attached Safety Evaluation Report documents the RL review and basis for approval of the submittal, which shall be implemented within 90 days of this approval.

If you have any questions, please contact us, or your staff may contact Ray J. Corey, Assistant Manager for Safety and Environment, on (509) 376-0108.


David A. Brockman
Manager


Jewel J. Short
Contracting Officer

SED:MWJ

Attachment

cc w/attach:
S. L. Feaster, WCH
T. A. Harris, WCH
D. H. Houston, WCH
D. L. Plung, WCH

RECEIVED

JUL 22 2009

WCH - DOCUMENT
CONTROL

Safety and Engineering Division
U.S. Department of Energy, Richland Operations Office

Safety Evaluation Report

Date Published: June 2009



618-10 and 618-11 Waste Burial Grounds
Safety Basis

SIGNATURE PAGE

Safety Evaluation Report
for the
618-11 and 618-11 Burial Sites

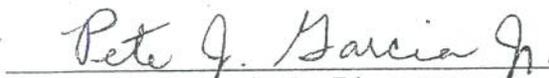
Prepared By:



Mark W. Jackson, Team Leader
Safety and Engineering Division

7-1-09
Date

Approved By:



Pete J. Garcia, Jr., Director
Safety and Engineering Division

7/2/09
Date

Introduction

This Safety Evaluation Report (SER) documents the RL review of the revisions to WCH-183, Rev. 1, Decisional Draft, 618-10 and 618-11 Waste Burial Grounds Basis for Interim Operations, and WCH-184, Rev. 1, Decisional Draft, Technical Safety Requirements for 618-10 and 618-11 Burial Sites. Revisions provide a more realistic bounding analysis for non-intrusive work planned at 618-11. The submittal also identified that there were no changes to NS-1-1.1, Washington Closure Hanford Criticality Safety Program, and WCH-144, Criticality Safety Program Description. Principle changes to the safety basis documents are related to clarifying activities as intrusive or nonintrusive, identifying the material at risk for postulated bounding accidents, and providing a revised bounding analysis to address non-intrusive characterization.

A number of non-intrusive activities are identified for both 618-10 and 11. These are expected to have limited potential for release of radiological or other hazardous material. Issues with potential releases in the proximity of Energy Northwest Generating Station as a result of work at 618-11 are addressed through a refined accident analysis. The potential to affect workers and members of the public other than those associated with RL activities presented the need to further refine existing analyses to provide a more realistic accident scenario that remains reasonably conservative.

The Review Team worked with Washington Closure Hanford (WCH) and personnel from Energy Northwest to ensure the revised analysis meets NRC licensing requirements and remains compliant with DOE safety analysis requirements.

Scope of Review

The WCH submittal from S. L. Feaster, WCH, to R. A. Stimmel, RL, letter 143330, dated March 4, 2009, included WCH-183, 618-10 and 618-11 Waste Burial Grounds Basis for Interim Operation, Revision 1 Decisional Draft; and WCH-184, Technical Safety Requirements for 618-10 and 618-11 Burial Sites, Revision 1, Decisional Draft for review and approval. Department of Energy staff from the Safety and Engineering Division, Operations Oversight Division, and Assistant Manager for River Corridor performed a review of the submittal. This review was performed under the applicable portions of the RL Integrated Management System Authorization Basis review procedure, and was consistent with DOE-STD-1104-96.

Review Summary

The WCH submittal includes several refinements to the documents; however, significant changes were limited to chapters 2 and 3, with clarification of non-intrusive and intrusive activities, reanalysis of a bounding accident related to non-intrusive characterization, and changes to the credited design features. Although developed to support Energy

Northwest in its licensing requirements, these changes are consistent with DOE guidance and requirements. Safety analyses in the Documented Safety Analysis (DSA) adequately support identified controls in the Technical Safety Requirements (TSR) document.

Review of WCH -183, 618-10 and 618-11 Waste Burial Grounds Basis for Interim Operation, focused primarily on the new analysis in support of non-intrusive characterization proposed for 618-11. Non-intrusive characterization includes radiation surveys, scans using ground penetrating radar, mapping using electromagnetic induction, geophysical delineation of Vertical Pipe Units (VPU) and caissons, use of a multi-detector probe inserted into GeoProbes™ or cone penetrometer that have been inserted using the direct push method, and soil samples taken in proximity to disposed waste to judge the potential spread of contamination.

Possibility for interaction with waste was assessed for these different characterization activities and two potential scenarios are apparent. Use of cone penetrometers along the centerline of trenches may intercept buried waste, and use of cone penetrometers adjacent to a VPU or caisson could conceivably bend or otherwise be diverted and strike the side of one of these underground structures. Precautions are taken to preclude this from happening, but an analysis was included to address the potential for the cone penetrometer to be misdirected and pierce the side of a caisson. This event bounds any consequences from interception of waste within a trench and therefore was chosen for further analysis.

Evaluation of a caisson penetration at 618-11 by a misdirected penetrometer assumed a resultant fire and explosion. No specific initiator was identified based on known contents of the caisson, but a general assumption was made that contents include flammable liquid or hydrogen gas trapped within a sealed container in the caisson. Penetration of the caisson by the penetrometer is assumed to induce an explosion within a container in the caisson, pressurize the caisson and cause a release of radioactive material. Subsequently a fire starts and adds to the release.

Material at Risk (MAR) is based on the entire 618-11 waste site source term. The site is comprised of 3 trenches, approximately 30,000 m³ each, 3 to 5 large caissons 2.4 m in diameter by 3 m long, and 50 VPUs .56 m in diameter by 4.6 m long. The tops of the caissons (only present at 618-11) are 4.6 m below grade, they are not sealed, and the structure is open at the bottom. An offset pipe with a cap connected the caisson to the surface 4.6 m above during operations; however, since closure of the burial site there is a minimum of 1.2 m of overburden on top of the pipe cap. The caisson, being the most likely source for the largest concentration of radioactive material in a small location, was used for the accident. The source term of a single caisson is conservatively considered to comprise 15 % of the total radioactive material in the waste site.

Fifty percent of the waste is assumed to be combustible based on historical waste handling processes. Airborne release fractions and respirable fractions were based on

guidance in SARAH (HNF-8739), which has been approved by DOE. An explosion is assumed to affect 5 percent of the contents, and the fire is assumed to consume the top 0.3 m of the container waste or 10 percent.

The Review Team accepts the postulated accident scenario and parameters applied as representing a reasonably conservative approach. A number of conservative assumptions were applied such as:

- Gross misdirection of the penetrometer;
- Ability of the penetrometer to penetrate a caisson given the angle of attack;
- Presence of hydrogen or flammable gas in a non-sealed system; and
- Presence of sufficient oxygen to support a fire.

An unmitigated analysis results in doses of $1.02\text{E-}02$ rem at the Hanford Site boundary, and 8.9 rem at 100 meters. This is based on a release assuming there is a direct path to atmosphere with no leak path factor. A mitigated analysis was completed that accounted for the soil overburden, and the physical reality of the penetrometer being in the puncture hole and thus obstructing releases through that pathway. Two release paths were considered, either up through the offset pipe and its soil overburden, or past the penetrometer and up through the soil overburden at that release point. Energetics of the explosion and subsequent fire are not considered sufficient to displace the soil overburden, resulting in any potential release passing through a soil column. Based on these mitigative features a leak path factor of 0.005 was applied. This value was supported by comparison to the leak path factors credited for buildings with active ventilation systems. Additional comparison can be made to the efficiency of a sand filter given presence of the soil column any release would move through to reach atmosphere. The Review Team agrees with the applied leak path factor.

The resultant dose consequences for the mitigated analysis are $5.1\text{E-}05$ rem at the Hanford Site boundary and $4.45\text{E-}02$ rem at 100 m. Both of these results are well below levels where additional controls are required or warranted for worker and public safety. Credited mitigation by the soil overburden requires elevation of the soil to a design feature to protect the assumptions in the analysis. The TSRs were modified to include the soil overburden covering the caissons and VPU's as a design feature for the 618-11 Burial site. Removal of the existing soil overburden is prohibited.

The Review Team judges the analysis to represent a reasonably conservative bounding accident, with adequate protection provided by the existing soil overburden. The Review Team recommends the RL approval authority approve non-intrusive characterization as described in section 2.4.3.1 of WCH-183, Rev. 1. Not included in this recommendation are intrusive activities within the 618-11 Burial Site.

Conditions of Approval

None.

Conclusion

Based on the above, the Review Team recommends the RL approval authority approve WCH-183, Rev. 1, Decisional Draft, 618-10 and 618-11 Waste Burial Grounds Basis for Interim Operations, and WCH-184, Rev. 1, Decisional Draft, Technical Safety Requirements for 618-10 and 618-11 Burial Sites. The Review Team also recommends the RL approval authority approve non-intrusive activities at the 618-11 Burial Site as described in section 2.4.3.1 of WCH-183, Rev. 1, and specifically prohibit intrusive activities within the 618-11 Burial Site.