

## 12. RCRA PHASE 2 CORRECTIVE MEASURES AND ASSOCIATED ACTIVITIES

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Phase 1 of the RCRA Corrective Actions Program was to perform field/laboratory characterization of the largest releases and implement interim measures. Phase 2 will perform remaining characterization required to analyze and determine final corrective actions.

### 12.1 INTRODUCTION

Phase 2 of the Hanford Tank Resource Conservation and Recovery Act (RCRA) Corrective Action Program (RCAP) will include the following:

- ◆ Additional characterization at the seven single-shell tank waste management areas required to define nature and extent of contamination and perform alternatives analyses for final closure,
- ◆ Evaluation of the characterization data to determine risk to all pathways, including groundwater, direct human contact, and ecological contact
- ◆ Preparation of a corrective measures study and selection of final cleanup actions.

Under Phase 2, interim measures ([Chapter 11](#)) may still be implemented where deemed appropriate. However, the primary focus of Phase 2 will be in determining human-health or environmental risks, analyzing alternative corrective measures to mitigate these risks, and selecting final corrective measures.

The initial step in the Phase 2 process is to define the data quality requirements that further characterization efforts must meet for adequate evaluation to be conducted to make closure decisions. These data will be used in developing a baseline risk assessment and completion of characterization of nature and extent, both of that will be used in the evaluation of alternatives in the corrective measures study.

Corrective measures that will be evaluated as part of Phase 2 will be selected based upon a preliminary screening evaluation of applicable technologies ([Section 12.4.1](#)). This screening is based on criteria of effectiveness, implementability, and cost. Selected technologies can then be carried forward into the corrective measures study for a detailed and comparative evaluation based on the expanded criteria of overall protection, compliance with applicable requirements, long-term protection, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, cost, implementability, state acceptance, and public acceptance. The corrective measures study will then propose an alternative, or set of alternatives, for corrective measures that will be reviewed by the Washington State Department of Ecology (Ecology). This will form the basis for Ecology to modify the single-shell tank system closure permit.

### 12.2 REGULATORY REQUIREMENTS

Past releases from tank farm areas have caused surface, vadose zone, and groundwater contamination that has led to a number of regulatory responses, including but not limited to

implementation of a Resource Conservation, and Recovery Act Corrective Action Program in accordance with the *Hanford Federal Facility Agreement and Consent Order* ([Ecology et al. 2007](#)) and [WAC 173-303-646](#). The *Hanford Federal Facility Agreement and Consent Order* (HFFACO) is informally known as the Tri-Party Agreement.

The U.S. Department of Energy, as a federal agency, must comply with the procedural and substantive requirements of [Resource Conservation and Recovery Act of 1976](#) (RCRA) in addition to [Executive Order 12580](#) (Superfund Implementation), [Executive Order 12088](#) (Federal Compliance with Pollution Control Standards), and the [Atomic Energy Act of 1954](#). As stated in Section 1006 (42 U.S.C. Section 6905) of [RCRA](#), DOE is not required to take any action pursuant to RCRA that is inconsistent with the requirements of the [Atomic Energy Act](#).

### **12.2.1 Requirements of the Resource Conservation and Recovery Act of 1976**

Resource Conservation and Recovery Act (RCRA) corrective action programs are authorized by Sections 6001, 3008(h), and 3004(u) and 3004(v) of [RCRA](#) [42 U.S.C. Sections 6961, 6928(h), 6924(u) and 6924(v)], as amended by the Hazardous and Solid Waste Amendments of 1984 ([HSWA](#)). The Hanford Tank RCAP is implemented under the *Hanford Federal Facility Agreement and Consent Order*.

In accordance with Section 3006 of [RCRA](#), the State of Washington has received authorization from the U.S. Environmental Protection Agency (EPA) to administer and enforce a state hazardous waste management program, in lieu of the federal hazardous waste management program within the State of Washington. The Department of Ecology (Ecology) is designated by the State of Washington’s “Hazardous Waste Management Act ([HWMA](#))” to implement and enforce the provisions of RCRA. The Corrective Action Program at Hanford will be conducted under the authorized state Hazardous Waste Management Area corrective action program in accordance with the provisions of the [Hanford Federal Facility Agreement and Consent Order](#), [WAC 173-303](#), and the *Hanford Facility RCRA Dangerous Waste Permit* ([WA7890008967](#)).

### **12.2.2 [CERCLA](#) Remedial Action Requirements**

HFFACO Appendix I states that *Comprehensive Environmental Response, Compensation, and Liability Act* ([CERCLA](#)) remedial action requirements will integrate with tank farm RCRA corrective actions. Because tank farms are within the CERCLA National Priorities List description for the 200 Areas of the Hanford Site, the completion of remediation of the 200 Areas will eventually be finalized via CERCLA decisions made by the EPA, and permitting decisions made by Ecology. In order to ensure consistency with CERCLA, Appendix I states that EPA will have a role in reviewing regulatory documents for tank farm closure, including those under corrective action.

Appendix I states, “Ecology, as the lead agency for SST System closure, EPA, and DOE are electing to investigate and remediate groundwater as part of the remedial investigation / feasibility study process under CERCLA. The information generated through the groundwater RI/FS [remedial investigation/feasibility study] process will be utilized in the development of SST System Closure Plans and Performance Assessment. Integration of CERCLA authority concurrently with RCRA closure and corrective action requirements, will allow Ecology and

EPA to address all regulatory and environmental obligations associated with contaminated groundwater regardless of the types of contaminants of concern being addressed.” Groundwater remediation is being performed pursuant to CERCLA for the associated groundwater operable unit (OU):

- ◆ 200-BP5: WMAs B-BX-BY and C
- ◆ 200-PO-1: WMA A-AX
- ◆ 200-UP-1 WMAs S-SX and U
- ◆ 200-ZP-1: WMAs T and TX-TY.

Groundwater-monitoring and response actions are integrated within the context of the *Hanford Federal Facility Agreement and Consent Order* Milestones M-24 and M-45 and, as feasible, would be integrated with, but separate from, the waste management area closure activities.

Releases from ancillary equipment such as pipelines and diversion boxes that are part of the tank farm system but outside of the waste management area fence line are part of the CERCLA 200-IS-1 Operable Unit.

[CERCLA](#) operable unit decisions for both groundwater and the 200-IS-1 Operable Unit will be integrated with RCRA and approved by Ecology in the RCRA site-wide permit.

### **12.2.3 Atomic Energy Act of 1954 and DOE Order 435.1 Requirements**

RCRA addresses chemically hazardous materials, but not radioactive materials. Under the [Atomic Energy Act of 1954](#), the U.S. Department of Energy (DOE) has established regulatory requirements for radioactive waste, including DOE’s Order on *Radioactive Waste Management* ([DOE O 435.1-1](#)). The *Radioactive Waste Management Manual* ([DOE M 435.1-1](#)), which implements the order, specifies criteria and processes for ensuring that radioactive wastes are generated, stored, treated, and disposed of in a manner that is protective of human health and the environment.

### **12.2.4 Hanford Federal Facility Agreement and Consent Order**

The *Hanford Federal Facility Agreement and Consent Order* ([Ecology et al. 2007](#)) implements the requirements of [RCRA](#) and [CERCLA](#) for the Hanford Site. Section 7 (“Past Practice Processes”) of Attachment 2 (“Action Plan”) of the HFFACO describes the overall process for the Tank Farm RCRA Corrective Action Program. Appendices H (“[Single Shell Tank Waste Retrieval Criteria Procedure](#)”) and I (“[Single Shell Tank System Waste Retrieval and Closure Process](#)”) describe tank waste retrieval and closure requirements. The [Hanford Federal Facility Agreement and Consent Order](#) also establishes a high-level schedule (Appendix D, “[Work Schedule and Designation of Lead Regulatory Agency](#)”) for overall single-shell tank system closure activities. The milestones provide a structure for developing detailed plans that specify activities and requirements for single-shell tank system closure, including Phase 1 and Phase 2 corrective action requirements.

### 12.2.5 Coordination with the National Environmental Policy Act (NEPA)

To implement its requirements under the National Environmental Policy Act, DOE issued a “Notice to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington,” ([76 FR 5655](#)). This notice informed the public and interested agencies that DOE was planning to prepare an environmental impact statement (EIS), to support ORP decisions regarding the following:

- ◆ Closing single-shell tank farms in a manner that complies with federal and Washington State requirements and protects the environment
- ◆ Immobilizing the retrieved waste in the waste treatment plant and through supplemental treatment technologies, such as bulk vitrification, containerized grouting, steam reforming, and sulfate removal, and to package the immobilized waste for onsite disposal or for offsite shipment and disposal in licensed and/or permitted facilities.

The Record of Decision for the Tank Closure and Waste Management Environmental Impact Statement will define DOEs selected alternative for proceeding with closure of the waste management areas including all of the tanks, ancillary equipment, and contaminated soil in the tank farm system. If post-closure care will be required because of residual waste in the single-shell tanks, residual soil contamination, or both, a post-closure plan will be submitted for incorporation into the Hanford Facility Dangerous Waste Permit with the closure plan. Final corrective actions for contaminated environmental media will be an element of the closure and post-closure plans. Specific final corrective action activities have not yet been identified and will depend on the amount of residual tank waste and environmental media contamination levels. The tank farm system will be incorporated into the Hanford Facility Dangerous Waste Permit when the closure and post-closure plans are approved by Ecology.

## 12.3 PATH FORWARD

The single-shell tank system closure process described in [Hanford Federal Facility Agreement and Consent Order](#) Appendix I emphasizes closure at the waste management area level. As planning continues, more information and detail will be included into the RCRA Site-Wide Permit for structural components and for corrective actions within the Waste Management Area. The initial Phase 1 effort is being followed by additional commitments for Phase 2 to address additional characterization efforts, the conduct of corrective measure studies and the associated corrective measures implementation.

There are three primary steps in waste management area soil component closure activities:

1. Characterizing the nature, extent, and mobility of the contamination in the soil column
2. Evaluating characterization information to define associated risks to human health and the environment and determine how best these risks can be mitigated through a comparison of corrective measure alternatives
3. Selecting and implementing necessary cleanup in accordance with applicable regulations.

The initial Phase 1 actions centered on the investigation and characterization at the single-shell tank waste management areas so that appropriate interim measures could be identified and implemented. The [RCAP Phase 1 Work Plan](#) and its implementation lead to an identification and confirmation of major release sites in the Waste Management Areas. The Phase 2 RCAP work will focus on verifying known and suspected release(s), and characterizing the nature, extent and rate of migration for releases of concern.

The Phase 2 RCAP will include interpretation of release characterization data over the entire waste management area to established health and environmental impact criteria which will be used in a waste management area corrective measures study. This evaluation is crucial to the RCRA Corrective Action process. The data and information collected during the Phase 2 RCAP activities must adequately describe all of the waste management area releases and be useable with a high degree of confidence to make decisions regarding where and what kind of corrective measures will be required.

Identifying and implementing interim measures may also be conducted during the Phase 2 RCAP. If, in the process of conducting the investigation, a condition is identified that indicates that adverse exposure to hazardous constituents is occurring, is imminent, or that future exposure can be mitigated, interim corrective measures may be needed. Based on the results of the Phase 2 RCAP, a human-health and environmental risk assessment will determine the need for interim corrective measures.

To ensure that appropriate data is collected to define nature and extent of contamination and perform a detailed and comparative analysis of corrective measure alternatives in a corrective measures study, a data quality objectives (DQO) process will be completed for each waste management area. The process will form the basis for a RCRA Facility Investigation/Corrective Measures Work Plan that will define the approach to characterization and will include Sampling and Analysis Plan for data collection. A RCRA Facility Investigation Report (an update of this report) will evaluate the Phase 2 data and will form the basis for the assessment of risk associated with contamination in the waste management area-specific performance assessment.

A corrective measures study will be prepared which will identify and evaluate specific measures to remediate or mitigate the risk. The corrective measures study will be prepared in accordance with the requirements of the [Hanford Federal Facility Agreement and Consent Order](#). Decisions concerning appropriate corrective measures would be determined through the RCRA facility investigation/corrective measures study process defined in condition II.Y of the RCRA Site-Wide Permit ([WA7890008967](#)), [WAC 173-303-645](#), [WAC 173-303-646](#), HFFACO Milestone M-45-55, and the RCRA corrective action process, as described in the HFFACO.

The CMS will contain an assessment of how the alternative corrective measures meet the general closure performance standards of [WAC 173-303-610](#). In planning integrated closure actions within the waste management area, these standards will determine how closure is achieved under [RCRA](#) requirements.

Following the corrective measures study for each waste management area, the remedies will be selected as part of a modification to the Site-Wide Permit and are implemented through corrective measures implementation. A corrective measures implementation plan will be developed that will identify technical specifications for the corrective measures. This includes designing, constructing, operating, maintaining, and monitoring the corrective measures.

## 12.4 REPORTS

Two reports that have been issued in support of corrective measures studies are the following:

- ◆ *Central Plateau Vadose Zone Remediation Technology Screening Evaluation* ([RPP-ENV-34028](#))
- ◆ *Identification of Selected Locations of Elevated Radiological and Chemical Contamination in Single-Shell Tank Farms A, BX, C, and SX* ([RPP-RPT-33053](#))

### 12.4.1 Vadose Zone Remediation Technology Screening Evaluation

The *Central Plateau Vadose Zone Remediation Technology Screening Evaluation* ([RPP-ENV-34028](#)) identifies potentially viable technologies or process options for remediation of contaminated vadose zone soil and includes a preliminary screening evaluation of these technologies based on criteria of effectiveness, implementability, and cost.

The report was developed in support of future [CERCLA](#) feasibility studies and [RCRA](#) corrective measures studies for operable units and waste management areas (WMAs) on the Central Plateau. Screening criteria used in the report are summarized in [Table 12-1](#). Recommended remediation technologies discussed in the report are summarized in [Table 12-2](#).

Table 12-1. Screening Criteria

Effectiveness	Implementability	Relative Cost
<p>Which contaminants will this method address?</p> <p>Will this method reduce toxicity, mobility, or volume of contamination (thereby reducing long-term human-health and environmental impacts?)</p> <p>Will this reduction be permanent?</p> <p>Is there a potential for this method to produce hazardous byproducts or affect groundwater?</p>	<p>Can the method be reliably constructed and operated or is it still in experimental phase?</p> <p>At what depth and relative area is the method effective?</p> <p>What is the relative risk to workers with respect to exposure and safety?</p> <p>What is the relative complexity of equipment required?</p> <p>What is the relative quantity of waste generated?</p>	<p>Given scoping calculations:</p> <ul style="list-style-type: none"> <li>• Scale of infrastructure and consumables</li> <li>• Number and size of boreholes or other subsurface access</li> <li>• Disposal costs</li> <li>• Operation and Maintenance costs</li> </ul> <p>Are the relative costs for capital and O&amp;M (per volume) expected to be grossly higher than other options with similar effectiveness and implementability?</p>

Table 12-2. Summary of Potentially Viable Technologies

Technology	Applicable COCs	Functional Aspect	Groundwater Pathway	Direct Exposure	Post-Closure Intruder	Effective Timeframe /Design Life	Uncertainty/Limitations	Comments
Interim Barriers (short-term)	ALL	Limit moisture infiltration	YES	Short term only	N/A (intrusion assumed to occur after institutional controls have lapsed and final closure)	Short, typically less than 50 years	Short term effectiveness for controlling surface moisture infiltration, stabilizing surface, and/or reducing direct exposure.	
Surface Barriers	ALL	Reduce moisture infiltration at the surface	YES	YES. Thickness of 15 feet or greater effectively eliminates direct exposure pathway	NO, unless barrier is designed to physically deter intrusion method	Design life < 1000 years. <a href="#">Single-shell tank performance assessment</a> assumes a maximum of 500 year effective life.	Limitations of design life only delays mobile contaminant arrival in GW. Lateral migration of moisture because of vadose zone heterogeneity may limit the depth of influence. Delayed influence at depth. Existing contaminated moisture will continue to migrate toward the water table	
Subsurface Barriers (isolation)	ALL	Isolate contaminants from moisture moving through subsurface	YES	YES. Assumes clean material above emplaced barrier	NO	Unknown. Placement below surface should reduce degradation because of weathering and surface erosion processes. Potentially >500 years.	Vertical barriers used in conjunction with either subsurface horizontal barriers (that is, macro encapsulation) or keyed into surface barriers may effectively reduce lateral moisture movement into contaminated material	Delivery of grout-like materials to the subsurface and verifying continuity of placement difficult. Drilling costs would be significant
Permeation Grouting	ALL	Isolate contaminants from moisture moving through subsurface. Potential for using sequestering reagents to chemically alter/bind specific contaminants	YES	YES. Assumes clean material above emplaced barrier.	NO (Assuming well driller scenario)	Unknown. Placement below surface should reduce degradation because of weathering and surface erosion processes. Potentially >500 years.	Verifying continuity of placement would be difficult. Shallow sites may be accessible using large auger (soil mixing), while deeper sites (greater than 30 to 40 feet) would require pressure injection	Drilling costs would increase substantially with depth. Less than 75 to 100 feet may be able to use direct-push technologies to reduce emplacement and verification costs. Geophysical methods may aid verification. Permeability and leach studies would be required to estimate design life/effectiveness
Desiccation (soil moisture extraction)	ALL	Reduce moisture to prevent continued migration of contaminants	YES	NO	NO	Unknown. Effectiveness will depend on net infiltration rate replacing moisture	Duration of effectiveness determined by net infiltration rate replacing extracted moisture at depth. Removing moisture from one zone may enhance lateral migration of moisture/contaminants from adjacent areas. Would require on-going periodic operation.	Combining soil-moisture extraction with surface/subsurface barrier emplacement may be the most effective application of this technology. Short-term control of moisture flux until passive barrier system is in place
In Situ Gaseous Reduction	Chromium	Irreversibly immobilizes hexavalent chromium to less toxic and less mobile trivalent chromium	YES, but long term effectiveness is limited to hexavalent chromium.	NO	YES (for hexavalent chromium only)	Potentially permanent treatment for hexavalent chromium. Tc-99, uranium, (and possibly nitrate and sulfate) may be less mobile, as long as reducing conditions are maintained, but will likely remobilize when treated zone reoxidizes because of to natural flux of oxygen in soil gas	Permanent for chromium under normal vadose zone conditions. Other affected mobile constituents would likely remobilize	Limited to waste sites where hexavalent chromium is the sole CoC of concern. Hydrogen sulfide gas is extremely hazardous to work with. Vadose heterogeneity will make it difficult to control treatment area. May be most effectively used in conjunction with soil vapor extraction as the physical requirements would be similar
In Situ Phosphate/Calcite Immobilization	Uranium, Sr-90, Cs-137(?)	Immobilizes CoCs based on chemical/mineral encapsulation	YES. Targeted at immobilizing COCs	NO	NO	If resulting chemical/mineral form is stable under normal vadose zone conditions, immobilization may be effective for a very long period of time	Unproven in vadose zone applications. Technology would require significant bench-top and field-scale demonstrations to assess its viability. Potentially applicable to a only a small number of CoCs	Unproven technology. Vadose zone heterogeneity presents significant challenge

Table 12-2. Summary of Potentially Viable Technologies

Technology	Applicable COCs	Functional Aspect	Groundwater Pathway	Direct Exposure	Post-Closure Intruder	Effective Timeframe /Design Life	Uncertainty/Limitations	Comments
Electrokinetics	Ionic CoCs. Tc-99, CN, Nitrate, I-129, Chromium oxyanions, Uranium anionic species.	Selective extraction of mobile ionic contaminants	YES	NO. Will not remove non-mobile radiological constituents (e.g. Pu-239, Cs-137, Am-241) that may be significant risk contributors for direct exposure pathway	YES	Permanent (removal)	Effectiveness highly dependent on site-specific vadose zone conditions (moisture, grain size, etc)	Previous case studies report mixed effectiveness. Recent proposed system modifications promise better results. Significant field testing would be required to assess viability
Remove, Treat, and Dispose	ALL	Removal and disposal under controlled, designed conditions	YES	YES	YES	Permanent (waste site location)	Costs increases significantly with depth. Disposal pathway (that is, capacity) limited. Ex situ treatment adds additional costs/handling. Waste site restoration	

CoCs = contaminants of concern

NA = not applicable

## 12.4.2 Selected Locations of Elevated Radiological and Chemical Contamination

The report, *Identification of Selected Locations of Elevated Radiological and Chemical Contamination in Single-Shell Tank Farms A, BX, C, and SX* ([RPP-RPT-33053](#)) was designed to support preliminary risk assessments for zero to 15 feet below ground surface by scaling contaminant levels in soil based on the results of spectral gamma logging of drywells.

Because limited data on surface soil exists for the Hanford tank farms, the study was limited to cesium-137 detected in existing drywells. As more drywells are drilled within the farms and as samples of surface soil are collected, more complete data will be available. Specific constituent concentrations were extrapolated for individual elevated regions based on peak cesium-137 concentration values as identified in the gamma logging data.

Four locations with elevated near-surface cesium-137 contamination were evaluated. The areas were selected based on cesium-137 levels and the ability to assign a specific waste type. [Table 12-3](#) shows cesium-137 concentrations and waste types for the locations evaluated.

Table 12-3. Assessment of Elevated Regions

Tank Farm	Borehole Number	Cesium-137 Concentration (pCi/g)	Waste Type <sup>a</sup>
A Farm	10-01-03	9.37E+05	PUREX high-level waste
BX Farm	21-10-03	2.04E+07	BY saltcake supernatant
C Farm	30-07-11	1.15E+05	B -Plant CSR waste
SX Farm	41-05-08	1.74E+05	REDOX-2 waste

<sup>a</sup> As defined in [Higley and Place 2005](#).

CSR = supernatant for cesium recovery process.

PUREX = plutonium-uranium extraction.

REDOX = reduction-oxidation.

## 12.4.3 Other Planning Documents

In addition to meeting the data needs to directly support the RCRA Corrective Actions process, it is important to understand the data needs involved in waste management area closure integration with the closure of the Central Plateau. The interfaces between the Central Plateau and the Waste Management Areas must be clearly accounted for in closure planning. The interactions and interfaces between Waste Management Area closure and other Central Plateau remediation and closure actions include waste sites, infrastructure, and groundwater. Proposed integration strategies for waste site remediation, infrastructure interface definition and remediation, and groundwater decision-making and remediation are being developed. The intent of these strategies would be to ensure that the Waste Management Area closure is closely coordinated with other actions on the Central Plateau and leads to consistency in the actions taken, clarity in the responsibilities for these actions, and completeness in the coverage of all actions that must be taken. Fundamental to the integration between Waste Management Areas and the Central Plateau would be a strategy that allows the Hanford DOE Field Offices (Office of River Protection and Richland Operations) to understand their respective processes to ensure that

decisions and strategies will accommodate structures and facilities at the interface areas and be complementary. Other planning documents relevant to the Phase 2 RCRA facility investigation/corrective measures study process include the following:

- ◆ *Near Term Data Quality Objectives for Vadose Zone Characterization Waste Management Area C* ([RPP-35169](#))
- ◆ *Waste Management Area Integration Study, Waste Management Area C* ([RPP-PLAN-25062](#))
- ◆ *Waste Management Area Integration Study, Waste Management Area T* ([RPP-PLN-25942](#))
- ◆ *Initial Single-Shell Tank Performance Assessment for the Hanford Site* ([DOE/ORP-2005-01](#))
- ◆ *Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Operable Unit RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-IS-1 and 200-ST-1 Operable Units* ([DOE/RL-2002-14](#))
- ◆ *Supplemental Remedial Investigation / Feasibility Study Work Plan for the 200 Area Central Plateau Operable Units* ([DOE/RL-2007-2](#))
- ◆ *Remedial Investigation/Feasibility Study Work Plan for the 200-BP-5 Groundwater Operable Unit* ([DOE/RL-2007-18](#)).

## 12.5 INTERIM SURFACE BARRIERS

In addition to the T-Tank Farm interim barrier demonstration interim measure described in Section 11.3.6 of [Chapter 11](#), interim surface barriers have been recommended for other sites and portions of other farms. Some of these may include the following sites.

### 12.5.1 Tank ER-311

Tank ER-311 is a small, underground catch tank southwest of B Plant near the eastern terminus of the cross-site waste-transfer line. Levels in this tank have declined. As part of remediation, installation of a polyurea interim barrier at this tank was recommended in *Options for Responding to the Assumed Leak from Catch Tank 241-ER-311* ([RPP-RPT-29484](#)).

Such a barrier would minimize waste migration resulting from precipitation. Initial recommendations are for a barrier, conservatively sized at approximately 100 feet by 100 feet, to cover both the assumed leak from catch tank ER-311 and a previous leak from the adjacent catch tank ER-311A. Minimal free liquid with very low concentrations of radiological or toxicological constituents remain in this catch tank ER-311 and the environmental impact of a continuing leak of the remaining liquid is low. Provisions are in place to minimize future intrusion into this catch tank, and liquid-level monitoring will ensure that additional moisture does not accumulate in the tank, which could potentially increase the plume size. Additional characterization is needed to determine the extent of contamination in support of barrier design.

### 12.5.2 Tanks 241-BX-101 and 241-BX-103

Interim barriers have also been recommended for Tanks BX-101 and BX-103 in an effort to stop water intrusion into these tanks. These barriers would also be polyurea barriers, designed similar

to that for the T-Tank Farm interim barrier. However, no monitoring would be required other than continued in-tank monitoring measurements to assess the effectiveness of the barrier.

### 12.5.3 SX Farm

An interim barrier is being considered for the SX Tank Farm based on modeling performed for the *Initial Single-Shell Tank Performance Assessment for the Hanford Site* ([DOE/ORP-2005-01](#)) that shows the potential to substantially reduce migration of past leaks from Tank SX-108 and other tanks in SX Tank Farm and to reduce concentrations at the water table for high risk contaminants of concern. The interim barrier for SX-Farm or other potential locations in the single-shell tank farms will be similar to the design and monitoring for T Tank Farm (see Section 11.3.6 in [Chapter 11](#)).

## 12.6 C-200 DEMONSTRATION PROJECT

The C-200 Demonstration Project will demonstrate a range of technical approaches and regulatory processes, some of which are relevant to Phase 2 corrective action planning activities and decision making for waste management areas. The C-200 system at Waste Management Area C was selected as the area of emphasis for the Project, because it includes most of the typical elements present in Waste Management Areas (such as tanks, encased and direct buried pipes, diversion boxes, pump pits, and unplanned release sites). Information and data generated will help the public and decision makers understand the options for closure and will support closure planning and decision making for all of Waste Management Area C and other waste management areas. It also will be relevant to environmental investigations, feasibility studies, and cleanup at other areas contaminated with tank waste in and around tank farm environments.

The overall objective of the C-200 Demonstration Project is to identify “what we need to know” to make closure decisions and to identify “how we will obtain the needed data” in a timely way. Many types of information will be gathered. Some information gathering (such as the tank stabilization demonstration) will involve activities that require new permitting; these activities will be addressed under a RCRA Research, Development, and Demonstration permit. Other information can be gathered through review of records and other existing data or as part of activities (such as characterization work) that does not require new permitting. Still, other information is being gathered as part of other efforts at the Hanford site, such as the ongoing RCRA facility investigation/corrective measures study.

The C-200 Demonstration Project has six specific objectives:

- ◆ Identify data needs to adequately characterize and close underground tanks, ancillary equipment, and contaminated soil
- ◆ Identify and field test technologies and techniques that might be used to characterize or clean up underground tanks, ancillary equipment, and contaminated soil and determine which are feasible for closure of tank systems
- ◆ Understand the flexibility in the RCRA closure requirements, and how these requirements interface with RCRA Corrective Action and [CERCLA](#) standards

- ◆ Test the radioactive waste determination process for single-shell tank waste residuals to meet regulatory criteria in [10 CFR 61](#) for on-site burial
- ◆ Better understand agency roles and develop a positive working relationship
- ◆ Forge a relationship with Tribal governments, stakeholders and the public on closure issues

The key areas of the C-200 Demonstration Project are the following:

- ◆ Soil characterization and removal
- ◆ Pipeline characterization and remediation demonstration
- ◆ Evaluation of historical records on piping,
- ◆ In Situ characterization and sampling technologies for pipelines
- ◆ Remedial treatment technologies for pipelines.

Additional details of the C-200 demonstration are included in “Transmittal of Final C-200 Demonstration Project Plan” ([Ecology 2007](#)).

## 12.7 REFERENCES

- 10 CFR 61, “Licensing Requirements for Land Disposal of Radioactive Waste”, Code of Federal Regulations, Volume 10, Part 61, U.S. Nuclear Regulatory Commission, Washington, D.C.
- 76 FR 5655, “Notice to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington,” *Federal Register*, Volume 76, pages 5655-5660, February 2, 2006
- Atomic Energy Act of 1954*. As amended, Ch. 1073, 68 Stat. 919, 42 USC 2011 et seq.
- Comprehensive Environmental Response, Compensation, and Liability Act*. 1980. Public Law 96-150, as amended, 94 Stat. 2767, 42 USC 9601 et seq. Also known as CERCLA.
- DOE M 435.1, “Radioactive Waste Management Manual”, DOE M 435.1, U.S. Department of Energy, Washington, D.C., July 1999.
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- DOE/ORP 2005-01, *Initial Single-Shell Tank Performance Assessment for the Hanford Site*, DOE/ORP-2005-01, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 2006.
- DOE/RL 99-36, *Phase 1 RCRA Facility Investigation/Corrective Measures Study Work Plan for SST Waste Management Areas*, DOE/RL-99-36, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington, June 2000.

DOE/RL-2002-14, *Tanks/Lines/Pits/Boxes/Septic Tank And Drain Fields Waste Operable Unit RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-IS-1 and 200-ST-1 Operable Units*, DOE/RL-2002-14, Revision 1, Draft B, U.S. Department of Energy, Richland Operations Office, Richland, Washington, June 2007.

DOE/RL-2007-2, *Supplemental Remedial Investigation / Feasibility Study Work Plan for the 200 Area Central Plateau Operable Units*, DOE/RL-2007-2, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington, March 2007.

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