DOE/EA-0915

Environmental Assessment

Waste Tank Safety Program, Hanford Site, Richland, Washington

U.S. Department of Energy
Washington, D.C.

February 1994

THIS PAGE INTENTIONALLY
LEFT BLANK

DOE/EA - 0915

ENVIRONMENTAL ASSESSMENT

WASTE TANK SAFETY PROGRAM

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

FEBRUARY 1994

This page intentionally left blank.

Executive Summary

The U.S. Department of Energy (DOE) needs to take action in the near-term, to accelerate resolution of waste tank safety issues at the Hanford Site near the City of Richland, Washington, and reduce the risks associated with operations and management of the waste tanks.

The DOE has conducted nuclear waste management operations at the Hanford Site for nearly 50 years. Operations have included storage of high-level nuclear waste in 177 underground storage tanks (UST), both in single-shell tank (SST) and double-shell tank configurations. Many of the tanks, and the equipment needed to operate them, are deteriorated. Sixty-seven SSTs are presumed to have leaked a total of approximately 3,800,000 liters (1 million gallons) of radioactive waste to the soil.

Safety issues associated with the waste have been identified, and include (1) flammable gas generation and episodic release; (2) ferrocyanide-containing wastes; (3) a floating organic solvent layer in Tank 241-C-103; (4) nuclear criticality; (5) toxic vapors; (6) infrastructure upgrades; and (7) interim stabilization of SSTs. Initial actions have been taken in all of these areas; however, much work remains before a full understanding of the tank waste behavior is achieved. The DOE needs to accelerate the resolution of tank safety concerns to reduce the risk of an unanticipated radioactive or chemical release to the environment, while continuing to manage the wastes safely.

Further, knowledge of the UST tank contents is incomplete, and based primarily on historical operating records which provide limited sampling information to confirm the waste inventory. The *Hanford Federal Facility Agreement and Consent Order* includes characterization commitments entered into by the DOE, the State of Washington Department of Ecology and the U.S. Environmental Protection Agency. As a result of these existing conditions and regulatory requirements, a more aggressive and focused approach is needed by the DOE in order to accelerate the resolution of the tank farm safety and operational issues.

Flammable gases are the most serious safety issue at the Hanford Site because substantial concentrations and volumes are periodically released from the tank waste. Mitigation efforts, including vapor monitoring and mixer-pump testing, are ongoing. In addition, workers also have been periodically exposed to potentially toxic vapors from the tanks. The DOE believes toxic vapor risks are greatest near Tank 241-C-103, but other tanks are potential toxic vapor sources. Further, some tanks contain chemicals (particularly ferrocyanide and organics) which, under certain limited conditions and high temperatures, could explode. Additional investigations need to be completed to more fully characterize these wastes in order to resolve the safety issues, and support the safe and effective storage of the waste.

The existing SSTs do not meet criteria for double containment. The pumpable liquid has been removed from many of the tanks, but approximately 19 million liters (5 million gallons) remain to be pumped from 43 tanks. The SST monitoring equipment and waste transfer systems also require upgrades to enhance leak detection and mitigation efforts.

Further, the tank farm infrastructure requires upgrading and physical modification. Physical or hardware upgrade needs include modernization of facilities, improvements in plant instrumentation and data collection systems, and modifications to ventilation systems. In addition, long-term upgrade needs exist, and include new waste transfer lines, replacement of tanks, and other major projects. These long-term upgrades, however, are not part of the scope of this Environmental Assessment (EA), but will be addressed in future, separate *National Environmental Policy Act of 1969* reviews.

It is expected that the actions proposed within the scope of this EA would provide data that would be useful in limiting the risk associated with the long-term actions. In addition, data generated would be useful in providing support for the safe interim storage of the waste until final disposition.

The proposed actions would include general and specific waste tank characterization and mitigation activities, and facility modifications, at the Hanford Site. This would allow the DOE to address tank safety concerns, while continuing to manage the waste safely. These activities would include installation, operation, maintenance, and removal of in-tank and external monitoring devices; modifications to ventilation systems; minor upgrades to the infrastructure of the tank farms; removal of pumpable liquids from SSTs; and sampling (by way of various modes) for waste characterization. The proposed actions would further the understanding of both routine operations and postulated accident scenarios associated with Hanford Site tank farm issues.

Alternatives have been considered in this analysis. Along with the No-Action Alternative, the DOE considered strategies involving less intrusive techniques for resolution of tank safety issues. For example, waste characterization using solely non-intrusive methods (such as computer modeling based on historical process knowledge and laboratory simulants) was considered. Also, a strategy involving limited intrusive activities (e.g., monitoring without characterization) was considered. These alternatives were not considered viable because the DOE believes intrusive operations (including monitoring, sampling, and minor modifications) are necessary to resolve the tank safety issues, and could be conducted without compromising worker and public safety.

The potential for significant individual and cumulative environmental impacts due to the conduct of the proposed action has been analyzed. No substantial increase in Hanford Site operational environmental impacts would be expected from the proposed actions. Rather, the proposed actions would contribute to an overall decrease in the potential risks associated with routine Hanford Site tank farms operations by resolving tank safety issues, and by increasing the understanding of waste characteristics.

The potential environmental impacts from postulated accident scenarios also were evaluated, and indicated that the risks associated with the proposed action would be small, and not substantially different than previously analyzed for similar actions. Indeed, the proposed actions would mitigate the potential for inadvertent releases of radioactive and hazardous materials from USTs.

Glossary

CY	Calendar Year
DOE	U.S. Department of Energy
DOH	State of Washington Department of Health
DOT	U.S. Department of Transportation
DST	double-shell tank
EA	Environmental Assessment
Ecology	State of Washington Department of Ecology
EDE	Effective Dose Equivalent
EPA	U.S. Environmental Protection Agency
FONSI	Finding of No Significant Impact
GAO	General Accounting Office
HDW-EIS	*Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington*
HLW	High-Level Waste
LCF	latent cancer fatality
LFL	lower flammability limit
LOW	liquid observation well
MEI	maximally exposed individual
NEPA	*National Environmental Policy Act of 1969*
NPH	normal paraffin hydrocarbon
PUREX	Plutonium-Uranium Extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
rem	roentgen equivalent man
SOP	Standard Operating Procedure
SST	single-shell tank
TBP	tributylphosphate
TCT	thermocouple tree
TMAC	Tank Monitor and Control System
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
USQ	Unreviewed Safety Question
UST	underground storage tank

This page intentionally left blank.

Table of Contents

Appendices

List of Figures

List of Tables

1.0 Purpose and Need for Agency Action

The U.S. Department of Energy (DOE) needs to take action in the near-term to accelerate resolution of waste tank safety issues at the Hanford Site near the City of Richland, Washington, and reduce the risks associated with operations and management of the waste tanks.

The DOE has conducted nuclear waste management operations at the Hanford Site for nearly 50 years. Operations have included storage of High-Level Nuclear Waste (HLW) in 177 underground storage tanks (UST), both in single-shell tank (SST) and double-shell tank (DST) configurations (Figure 1). Many of the tanks, and the equipment needed to operate them, are deteriorated. Sixty-seven SSTs are presumed to have leaked a total of approximately 3,800,000 liters (1 million gallons) of radioactive waste to the soil. Further, knowledge of the tank contents is incomplete, and is based primarily on historical operating records with limited sampling information to confirm the waste inventory. The *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement [Ecology et al. 1992]) includes characterization commitments entered into by the DOE, the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA). Further, on November 5, 1990, the U.S. Congress enacted Public Law 101-510, Section 3137, *Safety Measures for Waste Tanks at Hanford Nuclear Reservation*, which addresses safety issues concerning the handling of HLW contained in Hanford Site USTs, and directs the Secretary of Energy to take several steps to ensure safe management of tank waste. As a result of these existing conditions and regulatory requirements, a more aggressive and focused strategy is needed by the DOE in order to accelerate the resolution of the tank farm safety and operational issues.

Safety issues associated with the waste have been identified (DOE 1992a), and include (1) flammable gas generation and episodic release; (2) ferrocyanide-containing wastes; (3) a floating organic solvent layer in Tank 241-C-103; (4) nuclear criticality; (5) toxic vapors; (6) infrastructure upgrades; and (7) interim stabilization of SSTs. Initial actions have been taken to address each of these safety issues; however, much work remains to achieve a full understanding of the tank waste. The DOE needs to accelerate the resolution of tank safety concerns to reduce the risk of an unanticipated radioactive or chemical release to the environment, while continuing to manage the wastes safely.

Flammable gases are the most serious safety issue at the Hanford Site because substantial concentrations and volumes are periodically released from the tank waste posing an ignition risk. The consequences of an ignition potentially would be catastrophic. Mitigation efforts, including vapor monitoring and mixer-pump testing, are ongoing.

Workers have periodically been exposed to potentially toxic vapors coming from the tanks. The DOE believes toxic vapor risks are greatest near Tank 241-C-103, but other tanks also are potential toxic vapor sources.

Some tanks contain potentially unstable compounds such as ferrocyanide and organics, which under certain conditions, and high temperatures, could explode. Additional investigations need to be completed to more fully understand and characterize these wastes. The ongoing characterization program is vital to the resolution of safety issues, and support of safe and effective treatment and disposal of the tank waste.

Further, the tank farm infrastructure requires upgrade and physical modification. Physical or hardware upgrade needs include modernization of facilities, improvements in plant instrumentation and data collection systems, and modifications to ventilation systems. In addition, long-term upgrade needs exist, and include new waste transfer lines, replacement of tanks, and other major projects. These long-term upgrades, however, are not part of the scope of this Environmental Assessment (EA), but will be addressed in future, separate *National Environmental Policy Act of 1969* reviews.

The existing SSTs do not meet criteria for double containment. The pumpable liquid has been removed from many of the tanks, but approximately 19 million liters (5 million gallons) remain to be pumped from 43 tanks. Tank monitoring equipment and waste transfer systems require upgrades to enhance the DOE's ability to detect leaks and take mitigative measures.

2.0 Background

Hanford Site HLW management operations were addressed in the *Final Environmental Statement: Waste Management Operations, Hanford Reservation, Richland, Washington* (ERDA 1975). Routine operations and a range of postulated accidents based on facility design and operation were analyzed. Specifically included for HLW tanks farms were accident scenarios associated with leaks, gaseous releases, dome failures, transfer line failures, and events due to natural forces. In the *Final Environmental Impact Statement, Supplement to ERDA-1538, December 1975, Waste Management Operations, Hanford Site, Richland, Washington, Double-Shell Tanks for Defense High-Level Radioactive Waste Storage*, (DOE 1980), accident consequences for DST operations were evaluated (including accumulation of hydrogen, organic fire, explosion of nitrate compounds, and failure of vessel ventilation exhaust filters).

The DOE further addressed the risks associated with HLW management operations in the 1987 Environmental Impact Statement (EIS), *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes* (DOE 1987). The 1987 EIS concluded that the maximum reasonably foreseeable accident associated with the HLW tanks at the Hanford Site would be an explosion in a ferrocyanide-containing tank. Since completing the 1987 EIS, additional questions relevant to HLW tank risks have arisen, which are now reflected in the safety issues described above. For example, the DOE and the general public have a heightened awareness of the generation and episodic release of flammable gases in Tank 241-SY-101 and other HLW tanks, of uncertainties regarding the potential consequences of an explosion in a ferrocyanide-containing tank, and of potential worker hazards associated with toxic vapor releases. To address these issues, the DOE has taken several specific initial actions to gather information needed to understand and to reduce HLW tank farm risks. In view of the uncertainties associated with the risks at the HLW tank farms, including the potential for catastrophic consequences, the DOE has conducted appropriate safety and environmental reviews, including EAs, for each specific action to ensure that the DOE has evaluated and addressed the risks of the actions themselves.

In ten EAs, delineated in Table 1, the DOE analyzed specific initial actions proposed to address Unreviewed Safety Questions (USQ). The topic of USQs is addressed in DOE Order 5480.21, *Unreviewed Safety Questions* (DOE 1991a). [1] The specific areas of concern associated with the USQs are (1) flammable gas generation and episodic release; (2) ferrocyanide-containing wastes; (3) floating organic solvent layer in Tank 241-C-103; and (4) nuclear criticality. Specific USQ tanks are listed in Table 2. It is noted that as characterization and testing continue, additions and/or deletions to the list of specific USQ USTs may occur, resulting in changes to mitigative priorities on a tank-by-tank basis.

---

[1]Unreviewed Safety Question (as discussed in DOE Order 5480.21): A proposed change, test, or experiment or the identification of an analytic inadequacy shall be deemed to involve an Unreviewed Safety Question under any of the following circumstances: (1) If the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated by safety analyses could be increased; (2) If the possibility for an accident or malfunction of a different type than any evaluated previously by safety analyses could be created; or (3) If any margin of safety, as defined in the basis for any Technical Safety Requirement, could be reduced.

Table 1.
Environmental Assessments Surrounding Hydrogen Generation, Organics, and Ferrocyanides.

Environmental Assessment: Collecting Crust Samples from Level Detectors in Tank 101-SY at the Hanford Site, DOE/EA 0479, U.S. Department of Energy, Richland, Washington (DOE 1990).

Environmental Assessment: Characterization of Tank 241-SY-101, Hanford Site, Richland, Washington, DOE/EA-0511, U.S. Department of Energy, Richland, Washington (DOE 1991b).

Environmental Assessment: Upgrading of the Ventilation system at the 241-SY Tank Farm, Hanford Site, Richland, Washington, DOE/EA-0581, U.S. Department of Energy, Richland, Washington (DOE 1991c).

Environmental Assessment: Vapor Space Sampling of Ferrocyanide Tanks, DOE/EA-0533, U.S. Department of Energy, Washington, D.C. (DOE 1991d).

Environmental Assessment: Vapor Space Sampling of Ferrocyanide Tanks, Hanford Site, Richland, Washington, DOE/EA-0533, U.S. Department of Energy, Richland, Washington (DOE 1991e).

Environmental Assessment for Tank 241-SY-101 Equipment Installation and Operation to Enhance Tank Safety, DOE/EA-0802, U.S. Department of Energy, Washington, D.C. (DOE 1992b).

Environmental Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101, DOE/EA-0803, U.S. Department of Energy, Washington, D.C. (DOE 1992c)

Environmental Assessment: Intrusive Sampling and Testing of Ferrocyanide Tanks, Hanford Site, Richland, Washington, DOE/EA-0596, U.S. Department of Energy, Washington, D.C. (DOE 1992d).

Environmental Assessment: Thermocouple Tree System Installation and Operation in Non-Leaking Ferrocyanide Tanks, DOE/EA-0809, U.S. Department of Energy, Richland, Washington (DOE 1992e)

Environmental Assessment: Tank 241-C-103 Organic Vapor and Liquids Characterization and Supporting Activities, Hanford Site, Richland, Washington, DOE/EA-0881, U.S. Department of Energy, Richland, Washington (DOE 1993).

Table 2.
*Unreviewed Safety Question-Specific Underground Storage Tanks.
(September 1993)

Single-Shell Tanks

Tank Number	Category
101-A	Hydrogen
101-AX	Hydrogen
103-AX	Hydrogen
102-BX	Ferrocyanide
101-BY	Ferrocyanide
103-BY	Ferrocyanide
104-BY	Ferrocyanide
105-BY	Ferrocyanide
106-BY	Ferrocyanide
107-BY	Ferrocyanide
108-BY	Ferrocyanide
110-BY	Ferrocyanide
111-BY	Ferrocyanide
112-BY	Ferrocyanide
103-C	Floating Organic Solvent Layer
108-C	Ferrocyanide
109-C	Ferrocyanide
111-C	Ferrocyanide
112-C	Ferrocyanide
102-S	Hydrogen
111-S	Hydrogen
112-S	Hydrogen
101-SX	Hydrogen
102-SX	Hydrogen
103-SX	Hydrogen
104-SX	Hydrogen
105-SX	Hydrogen
106-SX	Hydrogen
109-SX	Hydrogen Potential. Other Tanks Vent Through It.
107-T	Ferrocyanide
110-T	Hydrogen
118-TX	Ferrocyanide

Single-Shell Tanks

Tank Number	Category
101-TY	Ferrocyanide
103-TY	Ferrocyanide
104-TY	Ferrocyanide
103-U	Hydrogen
105-U	Hydrogen
107-U	Hydrogen
108-U	Hydrogen
109-U	Hydrogen

Total: 40 SSTs

Double-Shell Tanks

Tank Number	Category
103-AN	Hydrogen
104-AN	Hydrogen
105-AN	Hydrogen
101-AW	Hydrogen
101-SY	Hydrogen
103-SY	Hydrogen

Total: 6 DSTs

* All 177 USTs at the Hanford Site fall under the criticality category for USQs.

Based on the information presented in the EAs listed in Table 1, the DOE issued Findings Of No Significant Impact (FONSI) for the respective actions. Subsequently, work has been conducted under the descriptions and restrictions provided by the EAs and FONSIs. In all cases, the DOE's experience in taking these actions indicates that the environmental and safety documentation was extremely conservative, and that the DOE could resolve the safety issues with minimal adverse environmental impacts. Sections 2.1 to 2.4 provide information pertaining to USQs. Section 2.5 provides a summary of information pertaining to noxious and toxic vapors.

2.1 Information Pertaining to Flammable Gas Generation

There are USTs on the Hanford Site in which the waste expands due to generation of gases (hydrogen, nitrous oxide, nitrogen, and ammonia). These USTs experience episodic releases of gases including hydrogen, and nitrous oxide. These gases can be flammable. Activities such as instrument insertion, maintenance and operation, sampling, and equipment removal in Tank 241-SY-101 (considered the most hazardous tank in this category) have been conducted safely under the analyses contained in several EAs (DOE 1990, DOE 1991b, DOE 1991c, DOE 1992b, and DOE 1992c). Such activities have been carried out with minimal adverse environmental impacts (e.g., no additional emissions above those normally experienced during routine tank farm operations), and no unanticipated events associated specifically with safety issues have occurred.

Ongoing analyses have evaluated the behavior of other tanks in the flammable gas generation category (i.e., Tanks 241-SY-103, 241-AN-103, 241-AN-104, and 241-AN-105). Compared to Tank 241-SY-101, these tanks retain gases in a similar fashion; however, at only about 10 percent of the rate for Tank 241-SY-101. Historical data pertaining to surface level changes supports the premise that these four tanks, and the remainder of the USTs in the flammable gas generation category, would not release enough gas to reach the lower flammability limit (LFL).

The DOE installed a test mixer pump in Tank 241-SY-101 in July 1993. The mixer-pump test results in Tank 241-SY-101 are encouraging in regard to mitigation of flammable gas generation and episodic release safety issues. To date, it appears that virtually all gases generated since pump installation have been vented safely from the tank as a result of pump tests. A series of full-scale tests are planned through May 1994. The DOE proposes to pursue closure of the Tank 241-SY-101 flammable gas USQ by early 1995.

2.2 Information Pertaining to Ferrocyanides

Ferrocyanide was added to radioactive waste in the 1950s to precipitate cesium-137 as part of the volume reduction program. A relatively high-heat producer, cesium-137 joined strontium-90 and transuranic elements in the sludge. Following precipitation, the supernant liquid was discharged to the ground, consistent with waste management practices at the time. Subsequently, postulated accident scenarios were developed in which an explosive release of tank waste might result during mechanical retrieval, due to the presence of sodium, nitrate, and ferrocyanide precipitates in a tank (DOE 1987), or due to excessive heat from radionuclide content (DOE 1992a).

The eighth quarterly report on the progress of activities addressing safety issues associated with ferrocyanide-containing tanks (WHC 1993a) indicates that USQ Tanks 241-C-112 and 241-C-109 lack the required components to initiate a detonation. Specifically, data show that there is a lack of fuel, inadequate heat source, and too much moisture in the waste to allow an event to occur. The DOE's Safety Initiatives (Wagoner 1993) include closure of the ferrocyanide USQ by January 1994.

Similar to Tank 241-SY-101, risks associated specifically with ferrocyanide-containing tanks, such as instrument insertion and operation, sampling, and equipment removal have been found to be small (DOE 1991d, DOE 1991e, DOE 1992d, and DOE 1992e). As with Tank 241-SY-101, conduct of operations related to ferrocyanide-containing tanks has proceeded with minimal adverse environmental impacts (e.g., no additional emissions above those normally experienced during routine tank farm operations).

2.3 Information Pertaining to Floating Organic Solvent Layer

Tank 241-C-103 contains a floating organic solvent layer, which poses a safety concern due to potential ignition of the organic vapors. Additionally, the DOE has occasionally detected noxious vapors at or in the vicinity of the tank. Recent information, developed from an estimate of the tank contents derived from historical records, suggests that the vapor space contents may not be flammable. A tank intrusive sampling program has proceeded safely (DOE 1993). Results indicate that the headspace is convectively mixed and nearly saturated with water vapor, supporting the nonflammability projection. The DOE's ongoing Safety Initiative (Wagoner 1993) involving Tank 241-C-103 includes completion of sampling and safety evaluations for the liquid organic by March 1994, and the proposed removal of the floating organic solvent layer from the tank by March 1995.

2.4 Information Pertaining to Nuclear Criticality

A USQ regarding the potential for nuclear criticality in Hanford Site's HLW tanks resulted from the discovery that although the Final Safety Analysis Reports for the tank farms stated that a criticality was not credible, the analysis to support that statement had not been performed adequately. The declaration of the USQ stopped all waste transfers in the tank farms (both generator-to-tank and tank-to-tank) and any other activity which might affect nuclear reactivity. Exceptions allowing waste transfers have been made, following criticality analyses, which supported a Justification for Continued Operations. This has allowed limited transfers under strict controls.

As a result of this USQ, analyses have been undertaken to establish that the tanks, in their current state, are subcritical. The results of the analysis of approximately 1,000 samples of tank waste have been used to establish that the tanks are subcritical by a substantial margin. The parameters of interest were plutonium concentration and the ratios of uranium to plutonium, iron to plutonium, manganese to plutonium, and the ratios of several other waste constituents, all of which act as neutron absorbers. In every instance the ratios did not exceed established subcritical parameters. This has supported the conclusion that the tanks are subcritical. Future waste transfers will be controlled to maintain a safe margin of subcriticality.

The DOE's Safety Initiatives (Wagoner 1993) include closure of the criticality USQ by March 1994. Closure of this USQ will be accomplished by an amendment to the Authorization Basis which would provide the analysis demonstrating that the tanks are subcritical by a substantial margin. No specific physical activities are planned.

2.5 Information Pertaining to Noxious and Toxic Gas Releases

Vapors that pose health hazards (e.g., ammonia) may be present in waste tank vapor spaces and, ultimately, the work spaces. Such vapors have been found in Tank 241-C-103. Nineteen vapor exposure events occurred at the Hanford Site between July 1987 and May 1993. All of the vapor exposures involved first-aid medical consultation, and some resulted in lost time to workers. Ten of these vapor exposure events were associated with the 241-C Tank Farm (many involving Tank 241-C-103). A program plan has been developed which focuses on Tank 241-C-103 as a pilot program; the appropriate elements of the plan methodology may then be applied to other waste tank vapor issues.

Current data from Tank 241-C-103 monitoring and analyses indicate that no substantial release of toxic vapors should occur as a result of ongoing storage and characterization activities (DOE 1993). Appropriate procedures and administrative controls (e.g., self-contained breathing apparatus is presently standard equipment for operators) are in place to mitigate potential worker, health, and safety impacts from noxious and toxic vapors. Minimal releases of ammonia, tributylphosphate (TBP), normal paraffin hydrocarbons (NPH), hydrogen cyanide, hydrazine, or oxides of nitrogen have resulted from ongoing characterization activities, with no known adverse health effects to workers.

3.0 Alternatives Including the Proposed Actions

3.1 Proposed Actions

The proposed actions would include general and specific waste tank characterization and mitigation activities, and facility modifications at the Hanford Site. The DOE proposes to implement the current program plan for specific activities as shown in Appendix A. This would allow the DOE to address the tank safety concerns, while continuing to manage the waste safely until the DOE implements final disposal of the tank wastes. These activities would include installation, operation, maintenance, and removal of in-tank and external monitoring devices, modifications to ventilation systems, minor upgrades to the infrastructure of the tank farms, as well as sampling (by way of various modes) for waste characterization. The proposed actions would further the understanding of Hanford Site tank farm issues, as they relate to both routine operation and postulated accident scenarios. The proposed actions emphasize the DOE's closure of the specific USQs, which were generated due to concerns involving potential loss of tank integrity from ignition or nuclear criticality, events that could release radioactive and hazardous chemical contamination to the environment. The DOE expects that the proposed actions could be conducted in a safe and environmentally sound manner, while achieving the goals of reducing tank farm risks, and supporting the ultimate disposition of Hanford Site tank waste.

Schedules and priorities would be reviewed and evaluated periodically based on concurrent planning and coordination between the DOE, the operating contractor, and appropriate regulatory authorities (including Ecology, EPA, and the State of Washington Department of Health [DOH]). This would be essential for the most efficient prioritization and use of resources and minimization of waste, while providing optimum protection to the human health and the environment and maintaining compliance with the Tri-Party Agreement (Ecology et al. 1992).

In every instance, the proposed actions would be governed by state-of-the-art engineering and relevant DOE orders and guidelines. Appropriate materials of construction, calibrations, quality assurance, safety documentation, and other necessary systems would be used.

Also, before the proposed activities are conducted, the DOE would review and/or prepare, as necessary, appropriate safety and environmental documentation to ensure potential risks had been completely evaluated, and adequately addressed in this EA. Implementation of any of the activities described in this EA would be carried out only after appropriate safety and environmental evaluations indicated that the work could be accomplished with minimal risk to workers, the public, and the environment. The activities would be conducted in conformance with contractor procedures and applicable environmental regulations which have been approved by the DOE. Each activity also would be evaluated against the current authorization basis to ensure that no new USQ would be involved.

Many proposed tank farm activities (Appendix A) involve in-tank and external monitoring and maintenance. In-tank monitoring includes (but is not limited to) the periodic installation, operation maintenance, and removal of remote devices such as video cameras, infrared scanners, neutron or gamma probes for moisture or liquid measurement, gas measuring probes, thermocouple trees (TCT), liquid observation wells (LOW), and surface level detectors. All equipment would be designed and constructed to appropriate standards (DOE 1989), with accompanying certification, and consideration given to necessary parameters (e.g., materials of construction, calibration, and detection levels).

The proposed actions also include waste characterization. The proposed activities would support the resolution of tank safety issues, improvement of the general waste characterization program, and the regulatory requirements set forth in the Tri-Party Agreement.

In addition to the characterization and mitigation measures, the proposed actions involve necessary capital improvements to the Hanford Site's 200 Area tank farm infrastructure aimed at upgrading the original design capabilities of the tank farms. The improvements would provide upgraded systems in the areas of ventilation, piping, electrical, instrumentation, and support facilities. These actions are consistent with the DOE policy of safe and environmentally sound nuclear waste management.

Many of these activities are considered routine in nature when not associated with the specific USQ tanks (Table 2), and are presently conducted in non-USQ tanks throughout the tank farms. The proposed actions encompass some activities evaluated in other NEPA reviews (ERDA 1975, DOE 1980, DOE 1987), and the EAs listed in Table 1.

3.1.1 Unreviewed Safety Question-Flammable Gas Tanks (Hydrogen Tanks)

Table 1 includes a list of those specific tanks currently designated for flammable gas (hydrogen) USQs. The DOE addressed specific actions involving hydrogen generation in Tank 241-SY-101 (DOE 1990, DOE 1991b, DOE 1991c, DOE 1991d, DOE 1992b, and DOE 1992c). The DOE incorporates these previous EAs by reference, and believes the risk of the proposed action is small, and no greater than those projected in the aforementioned EAs.

This belief is based on the fact that other flammable gas tanks present the same safety concerns and hazards as addressed in the previous documentation (e.g., vapor ignition, gas release, sample drops, and spills) but on a reduced scale as compared to Tank 241-SY-101. Historical data and ongoing safety reviews indicate that the risks associated with other flammable gas tanks would be less than those for Tank 241-SY-101. For example, as discussed in the "Planned Work Activities for Tank 241-SY-103," (Harmon 1993), gas release events in flammable gas USQ Tank 241-SY-103 occur less frequently than those in Tank 241-SY-101, and when they do occur, they are of a smaller magnitude with no increase in tank pressure.

3.1.1.1 Installation, Operation, and Removal of In-Tank Monitoring Equipment. The proposed actions would involve the installation and operation of in-tank monitoring equipment in USQ flammable gas tanks. The present planning base, shown in Appendix A, includes (but is not limited to) such items as video cameras, gas probes, viscosity measuring devices, multi-functional instrument trees, TCTs, and surface monitoring equipment. Additionally, the proposed actions would include the removal of these items for maintenance and replacement, as well as the removal and disposal of existing equipment such as sludge weights and air lances.

Approved procedures and controls would be in place prior to initiation of the proposed activities. For example, prior to beginning the proposed installation and removal of equipment, the vapor space would be sampled to assure that no flammable gases greater than 25 percent of the LFL were present (using a calibrated gas flammability meter). A riser flange would be removed and the appropriate sampling and testing system inserted. Any item(s) removed from the tank would be appropriately packaged and shipped to an onsite facility(s) for treatment (if necessary), storage and/or disposal.

Minor alterations to existing tank configurations (e.g., installation of riser inserts, modifications to pump pits) may be conducted to enhance monitoring flexibility and capability and/or operational safety. Structures (such as small control room buildings or concrete pads) may be constructed to support existing and expanded instrumentation controls and computerized data acquisition systems.

Additionally, storage and episodic release of flammable gas mixture (hydrogen and oxides of nitrogen) mitigation evaluations are underway. Examples include mixer-pump testing, which is currently ongoing in Tank 241-SY-101. The proposed actions would, based on the results of that testing (anticipated to be completed in Calendar Year [CY] 1994), include installation, operation and maintenance of additional mixer pumps in other flammable gas tanks. The environmental impacts of a similar, specific activity in Tank 241-SY-101 were analyzed, and determined to be insignificant (DOE 1992c). Other proposed mitigation testing includes thermal cycling (i.e., intervals of in-tank heating and cooling), waste dilution studies, and effects of sonic probes and vibratory oscillation of tank waste to alleviate pressure buildup. The proposed actions would include removal of mitigation equipment for replacement or maintenance, or onsite disposal should such items prove to be ineffective or unnecessary.

The DOE expects that the risks associated with all proposed activities pertaining to flammable gas tanks, either currently documented or those which may be identified based on additional operational data, would be small and less than the risks associated with installing a mixer-pump in Tank 241-SY-101. This is based on historical data and ongoing safety reviews which indicate that although similar event initiators are present, risks associated with other flammable gas tanks would be less than those for Tank 241-SY-101. Appropriate safety review would be completed to verify this expectation prior to future activities.

3.1.1.2 Waste Characterization. The DOE proposes to further characterize the waste in USQ flammable gas tanks by intrusive means, such as using auger and core sampling, or similar methods. The equipment systems also might include a sludge weight system and a penetrometer testing system (DOE 1992d). Appropriate controls, provided by approved procedures, would be in place prior to the proposed activities. The general activities are summarized as follows.

The vapor space would be sampled to assure that no flammable gases greater than 25 percent of the LFLs were present (using a calibrated gas flammability meter). A riser flange would be removed, and the appropriate sampling and testing system inserted. Samples would be obtained, (typically less than 1 liter [0.25 gallons] of sludge or 100 milliliters [0.025 gallons] of liquid waste) and the system removed completely from the tank, using essentially the reverse of the installation procedures. The samples would be inserted into compatible shipping casks (or other approved transportation equipment) for transport to appropriate laboratory facilities for analyses. The contaminated sampling equipment would be appropriately packaged (e.g., placed in plastic bags and/or other appropriate additional containment for decontamination and reuse or disposal), using standard packaging procedures.

It is anticipated that most samples would be transported to laboratory facilities onsite (e.g., the 222S Laboratory in the 200 West Area or the 325 Facility in the 300 Area). Additionally, selected samples may be sent to approved laboratories offsite. In either case, Standard Operating Procedures (SOP) and approved shipping containers (e.g., proper shielding, materials of construction, applicable regulations [e.g., U.S. Department of Transportation]) would be used, or reviewed and revised as appropriate. It is anticipated that the samples transported offsite would typically contain less than less than 1 liter (0.25 gallons) of sludge or 100 milliliters (0.025 gallons) of radioactive liquid waste.

Sampling would be conducted using SOPs for sampling HLW waste tanks, which reflect the potential presence of flammable or explosive material in the tank or waste. The proposed actions would be conducted using non-sparking materials, electrical bonding, spark resistant tools, portable containment enclosures (i.e., greenhouses), and plastic ground cover around the riser used for sampling. Prior to actual use of these systems, specific tank farm operating procedures would be reviewed, and revised as necessary.

3.1.1.3 Ventilation System Monitoring and Minor Modifications. The proposed actions would involve installation and operation of Tank Monitor and Control Systems (TMAC), flow meters, thermocouples and humidity gauges on vent headers of waste tanks, as well as inlet filter installations, and monitoring (e.g., gas analysis) cabinets and other equipment. Minor modifications (e.g., sparkless fan installations, modular exhausters, piping connections, riser reconfigurations, miscellaneous hardware additions) to existing systems also may occur to enhance flow patterns, and discharge filtration efficiency. Appropriate safety documentation would be reviewed and/or prepared prior to initiation of activities.

3.1.2 Unreviewed Safety Question-Ferrocyanide Tanks

Table 1 includes a list of those specific ferrocyanide-containing tanks currently designated USQs. Previously approved NEPA documentation (DOE 1991e, DOE 1992d, and DOE 1992e) exists supporting data collection in certain ferrocyanide-containing tanks. Ferrocyanide was used in early chemical processing operations for the removal of cesium from the waste. Safety concerns are associated with a postulated explosive release of tank waste resulting during mechanical retrieval, due to the presence of sodium, nitrate, and ferrocyanide precipitates in a tank (DOE 1987), or due to excessive heat from radionuclide content (DOE 1992a).

3.1.2.1 Installation, Operation, and Removal of In-Tank Monitoring Equipment. The proposed actions would involve the installation and operation of in-tank monitoring equipment in USQ ferrocyanide tanks. The present planning base (Appendix A) includes (but is not limited to) such items as infrared scanning equipment for surface anomalies and moisture measurement, LOWs, gamma or neutron probes for moisture or liquid measurement, waste chemical sensors, continuous gas measurement system, and additional TCTs. Additionally, the proposed actions would include the removal of these items for maintenance and replacement, as well as the removal of old equipment such as sludge weights and air lances. Approved procedures would be in place prior to the proposed activities, with the vapor space tested for flammable gases. Removed items would be appropriately packaged and shipped to an onsite facility(s) for treatment (if necessary), storage and/or disposal.

3.1.2.2 Waste Characterization. As with the flammable gas tanks (Section 3.1.1.2), the DOE proposes to further characterize the waste in USQ ferrocyanide-containing tanks. Sludge samples would be obtained using sampling methods similar to those discussed for flammable gas tanks. The general procedures discussed earlier for flammable gas tank sampling, including appropriate safety reviews prior to initiation of activities, (Section 3.1.1.2) also are applicable.

3.1.2.3 Ventilation System Enhancements and Minor Modifications. The proposed actions would allow installation and operation of TMAC, flow meters, thermocouples, and humidity gauges on vent headers of ferrocyanide-containing waste tanks, as well as inlet filter installations, and monitoring (e.g., gas analysis) cabinets and other equipment. Minor modifications (e.g., piping connections, minor riser reconfiguration, miscellaneous hardware additions) to existing systems also would occur to enhance flow patterns and discharge filtration efficiency, and deter uncontrolled temperature increases.

3.1.3 Unreviewed Safety Question-Floating Organic Solvent Layer in Tank 241-C-103

Tank 241-C-103 is one of the original approximately 2 million-liter (530,000-gallon) tanks constructed from 1943 to 1944. A USQ was declared for this tank in September 1992, because the potential for ignition and combustion of the floating organic solvent layer is not fully addressed by existing safety documentation. It is believed that the organic layer (estimated to be less than 150,000 liters [less than 40,000 gallons]) consists of approximately 70 volume percent TBP and approximately 30 volume percent NPH, both of which were used in the Plutonium-Uranium Extraction (PUREX) process. The PUREX process was designed for individual separations of uranium, plutonium, neptunium and fission products via solvent extraction (DOE 1983). The material is present due to transfer of tank waste from Tank 241-C-102 during CY 1975.

3.1.3.1 Organic Characterization. The proposed actions would continue the vapor and liquid characterization of Tank 241-C-103 (DOE 1993). Additional data would verify the composition and volume of material, and assist in determining the interim options and final disposition of the floating organic solvent layer.

3.1.3.2 Organic Removal. The proposed actions would include removal of the floating organic solvent layer to regulatory-compliant storage (e.g., *Resource Conservation and Recovery Act of 1976* [RCRA]) in the 200 East Area prior to final disposition. The transfer operations would be conducted using properly engineered systems designed to minimize the risk to the workers and the public. These would include enclosed and shielded pumping and transfer systems as well as designs which minimize the risk of solvent ignition. Based on past experience at the Hanford Site, no unique hazards to workers or the general public would be expected from the removal and storage of this material. Large volumes of contaminated organics have been managed safely on a routine basis during PUREX processing (ERDA 1975, DOE 1987). It is anticipated that standard technology (i.e., use of sparkless tools for the installation of a floating suction pump), and subsequent transfer of the organic solvent layer to existing non-HLW tankage (designed for safe storage of radioactive materials) would be used, with no additional emissions or exposure above those currently being experienced during base storage operations.

Initial sample analyses of the floating organic solvent layer indicate that the low surface dose rates would allow the material to be pumped directly to approved (e.g., U.S. Department of Transportation [DOT], RCRA) tanker truck or other transportable vessels, located near Tank 241-C-103, prior to final disposition. However, should additional analyses indicate radiological contamination above applicable threshold limits, consideration would be given to pumping the material directly to the 244-CR vault for interim storage. The 244-CR vault is located nearby in the 200 East Area, and transfer would be conducted by way of the Tank 241-C-103 valve pit, using existing transfer lines.

Several options for final organic disposition are presently being explored in an engineering study (anticipated to be completed by the end of June 1994). Potential alternatives would include routing the material through PUREX for packaging (i.e., truck tankers or 55-gallon drums) and subsequent shipment to an appropriate facility for use as fuel for diesel boilers (adequacy of the material for fuel would depend upon radiolytic content and ratio of TBP and NPH). The shipment of the organic liquid would comply with DOT packaging and shipping requirements. Also, consideration is being given to distillation of the material, with the radioactive residue (radioactive mixed waste) stored onsite in RCRA-compliant units. The nonradioactive distillate would be transported offsite for incineration at a properly permitted facility. Additional NEPA review, as appropriate, would be conducted prior to final disposition of the organic.

3.1.4 Unreviewed Safety Question-Nuclear Criticality

No physical activities associated with the proposed actions would be directed towards closure of the criticality USQ (i.e., characterization work or equipment modifications). None of the proposed actions would be expected to impact the nuclear reactivity of the tanks and therefore would not alter their subcritical state. Closure of the criticality USQ would be accomplished by the DOE's completion of an amendment to the Authorization Basis, which must provide the analyses to demonstrate that the tanks are subcritical by a substantial margin. The DOE anticipates closure of the criticality USQ by March 1994.

The conclusions stated apply to the tanks in their current configuration, and do not include considerations that would be involved in future operations, such as retrieval or pre-treatment, which would be evaluated under separate NEPA review. Each of these cases would require safety analysis from which appropriate controls would be devised to assure that subcritical conditions are maintained.

3.1.5 Toxic Vapors

The proposed actions would include sampling and characterization of vapors from suspect tanks using comparable vapor space sampling equipment, and similar methods which were used for Tank 241-C-103 (DOE 1993). The proposed actions also would include ventilation system enhancements and minor modifications to mitigate noxious and toxic vapor emissions.

3.1.5.1 Vapor Space Characterization. The proposed actions would involve the installation and operation of appropriate in-tank monitoring equipment. The present planning base includes (but is not limited to) such items as continuous gas measurement systems and gas tracer experiments. The proposed actions would include the removal of these systems (or portions thereof) for maintenance and replacement, as well as the removal of old equipment such as sludge weights and air lances.

Prior to entrance to the tank farms, personnel would monitor for the presence of toxic vapors and follow the appropriate mitigation actions (e.g., protective clothing, self-contained breathing apparatus). Approved procedures would be in place prior to the proposed installation activities, with the vapor space tested for flammable gases before entering tank containment. Removed items would be appropriately packaged and shipped to an onsite facility(s) for treatment (if necessary), storage and/or disposal. This activity is being proposed on the basis of information obtained from prior vapor space characterization work performed by the DOE, and would be a continuation and extension of operations surrounding Tank 241-C-103 (DOE 1993).

3.1.5.2 Ventilation System Enhancements and Minor Modifications. The proposed actions would include minor ventilation upgrades to toxic vapor tanks, where warranted. The activities may include such items as inlet filter installations (to ensure filtered pathways under all conditions), monitoring (e.g., gas analysis) cabinets, and other equipment. Minor modifications (e.g., piping connections, miscellaneous hardware additions) to existing systems also may occur to enhance flow patterns and discharge filtration efficiency, and deter uncontrolled vapor increases.

3.1.6 Infrastructure Upgrades

A draft restoration and upgrades plan for the Hanford Site tank farms is presently being developed, with activities projected for completion beyond the year 2000. The draft plan includes longer-term activities such as new HLW transfer lines, and replacement tanks. Such activities would be addressed under separate, appropriate NEPA documentation when sufficient information becomes available, and would provide an evaluation of individual and/or cumulative environmental effects. Based upon the draft plan, the proposed actions have been developed to be consistent with the long-term requirements, and would not limit or preclude future options.

The proposed actions addressed in this EA would include modernization of facilities, improvements in plant instrumentation and data collection systems, and minor modifications to ventilation systems, as required. For example, activities would include items such as installation of permanent personnel changeroom facilities (i.e., prefabricated structures to allow change into protective clothing for personnel safety), alarm panel upgrades, and replacement of compressed air systems.

3.1.7. Interim Stabilization of Single-Shell Tanks

The 149 SSTs have been in service longer than the originally projected design life, and do not meet current regulatory requirements such as double containment. Sixty-seven SSTs are presumed to have leaked a total of approximately 3,800,000 liters (1 million gallons) of radioactive waste to the soil. The pumpable liquid has been removed from 106 tanks. However, an estimated 19 million liters (5 million gallons) of pumpable liquids still remain in 43 of the SSTs. This proposed action would remove the pumpable liquid from the

43 SSTs to minimize the impact from potential future tank leaks. This type of activity has been conducted routinely in the past (DOE 1987). Although the interim stabilization program is going forward, the ability to continue to transfer this liquid waste to appropriate DST storage has been impeded by general tank safety issues and deteriorated waste transfer systems.

Under the DOE's current waste management program, if ongoing monitoring indicated that a specific SST had become an assumed leaker (i.e., questionable integrity), that tank would be elevated on the priority list for appropriate stabilization actions regardless of its operational status. The DOE proposes to continue this program. For example, Tank 241-T-101 (a ferrocyanide-containing USQ SST) was determined to be an assumed leaker, and was pumped in accordance with approved procedures, to a DST in 1993. These approved procedures establish the safety evaluations necessary to assure safe transfer of waste.

3.1.7.1 Installation, Operation, and Removal of Leak Detection Equipment. The proposed actions would include upgrades to leak detection equipment associated with SSTs, providing enhanced response to, and mitigation of, inadvertent liquid waste releases to the environment. Activities would include (but not be limited to) electrical modifications, alarm panel installation, LOW installation, upgraded level detectors and instrumentation, and upgraded radiation detectors.

3.1.7.2 Removal of Pumpable Liquid from Single-Shell Tanks. The proposed actions would include continued tank-to-tank transfer of pumpable liquid from SSTs to DSTs, as appropriate, prior to final disposition of the tank waste. Primary consideration would be given to the use of existing pumps, and in-tank and underground transfer piping hardware.

Additional equipment (e.g., saltwell screens, submersible pumps, and/or above-ground, shielded, interim transfer lines) would be installed, as appropriate, based on case-by-case adequacy of existing hardware, as determined by safety documentation. The overground transfer system would consist of a primary pipe located inside secondary containment. The piping would take the straightest possible route from one tank pit to another tank pit. The liquid radioactive tank waste would be routed through an inlet nozzle located in the SST pump pit, and then through existing underground process lines into a DST receiver.

3.1.8 High-Heat Generation

The DOE's Safety Initiatives (Wagoner 1993) specifically address Tank 241-C-106. The tank contains waste which generates sufficient heat to require the addition of cooling water to ensure that temperature levels remain well below boiling, maintaining protection of the tank structure from damage due to overheating. Since this tank is a SST, it has a higher likelihood of leaking in the future.

3.1.8.1 Installation, Operation, and Removal of In-Tank Monitoring Equipment. The proposed actions would involve the installation and operation of in-tank monitoring equipment. The present planning base includes (but is not limited to) such items as infrared scanning equipment for surface anomalies and moisture measurement, LOWs, neutron probes for moisture measurement, waste chemical sensors, continuous gas measurement systems, and additional TCTs. Additionally, the proposed actions would include the removal of these items for maintenance and replacement, as well as the removal of old equipment such as sludge weights and air lances. Approved procedures would be in place prior to the proposed activities, with the vapor space tested for flammable gases. Removed items would be appropriately packaged and shipped to an onsite facility(s) for treatment (if necessary), storage and/or disposal.

9413273.0378

3.1.8.2 Sluicing of Tank 241-C-106. Tri-Party Agreement Milestone M-05-08 calls for the interim stabilization of Tank 241-C-106 in order to stop the practice of adding cooling water to the tank. Another milestone under the Tri-Party Agreement (M-07-00) calls for the initiation of a demonstration of one form of SST retrieval. To address these needs, the DOE proposes to install several sluicers and a submersible pump in Tank 241-C-106, install a sluicer pump in a receiver tank (Tank 241-AY-102), and provide various improvements to the two tank farms to facilitate the sluicing operations. These actions are mentioned here only for completeness, as a separate NEPA review is being developed to address the aforementioned transfer operations for continued storage prior to final disposition.

3.2 Alternative(s) to the Proposed Actions

3.2.1 No-Action Alternative

Under the No-Action Alternative, tank farm operations would continue under existing conditions. That is, ongoing monitoring, maintenance, characterization and stabilization activities with existing NEPA coverage (ERDA 1975, DOE 1987), and the EAs listed in Table 1, would continue. There would be no additional installation, operation, or removal of in-tank monitoring equipment; modifications to ventilation systems; sampling of vapors and wastes; or stabilization activities as described for the proposed actions (Sections 3.0 and 3.1). This would impede resolution of the USQs in a timely fashion. The lack of information obtained from tank monitoring and waste characterization, coupled with minimal facility modifications and upgrades, could increase the risk of chemical and radiation exposure to workers, the public, and the environment, in the event of a breach of tank containment. This alternative would be inconsistent with the DOE's commitment for closure of the USQs, and the Congressional directive to the DOE to take the necessary steps to ensure safe management of Hanford Site tank waste.

3.2.2 Strategies Involving Non- or Minimal-Intrusive Operations

The DOE considered less intrusive strategies involving closure of the USQs. For example, waste characterization using solely non-intrusive methods such as computer modeling based on historical process knowledge, and laboratory simulants, was considered. This approach, while having merit for reduction of worker exposure and avoiding initiators that could result in a severe accident, has limited utility because actual tank data are required to validate theoretical projections.

Similarly, minimizing the intrusive operations to monitoring activities, for example, would not provide the necessary data to close the USQs.

3.2.3 Other Alternatives

No other reasonable alternatives were identified for addressing the waste tank safety issues.

Final disposition of the floating organic solvent layer in Tank 241-C-103 would undergo additional NEPA review, as appropriate, when sufficient information about the associated actions and their alternatives are available. Similarly, issues discussed earlier pertaining to major out-year tank farm infrastructure upgrades in future years would be evaluated under separate NEPA review, as warranted, based on the results of future engineering studies.

This page intentionally left blank.

4.0 Affected Environment

The tank farms are located in the 200 Areas of the approximately 1,450 square kilometers (560 square mile) semiarid Hanford Site in the southeastern portion of the State of Washington (Figure 2). The 200 East Area is approximately 10 kilometers (6 miles) west of the Columbia River, the nearest natural watercourse. The 200 West Area is approximately 5 kilometers (3 miles) further west. The nearest population center is the City of Richland, approximately 32 kilometers (20 miles) away to the south.

The Hanford Site has a mild climate with 15 to 18 centimeters (6 to 7 inches) of annual precipitation, and infrequent periods of high winds of up to 128 kilometers (80 miles) per hour. Tornadoes are extremely rare; no destructive tornadoes have occurred in the region surrounding the Hanford Site. The probability of a tornado hitting any given waste management unit on the Hanford Site is estimated at 10 chances in 1 million during any given year. The region is categorized as one of low to moderate seismicity.

The 200 Areas are not located within a wetland or in a 100- or 500-year floodplain. No plants or animals on the federal list of "Endangered and Threatened Wildlife and Plants," (50 CFR 17) are found in the immediate vicinity of the tank farms addressed in this EA, nor would existing plant or animal species found on the Hanford Site be affected by the activities associated with resolving USQs. The geology of the site, where the proposed actions would take place, is typical of the 200 Areas. The surface is veneered with loess and sand dunes of varying thickness, although the tank farms and the majority of the area between them is composed of a disturbed gravel layer. Under the surface layer, in ascending order, are basement rocks of undetermined origin, the Columbia River Basalt Group with intercalated sediments of the Ellensburg Formation, the Ringold Formation, the Plio-Pleistocene unit, and the Hanford Formation. The depth to groundwater for the 200 Areas is 75 meters (246 feet). Groundwater flow direction is generally in an easterly and southeasterly direction, toward the Columbia River. The proposed actions would not be expected to impact the climate, flora and fauna, air quality, geology, hydrology and/or water quality, land use, or the population (DOE 1987, DOE 1990, DOE 1991c, DOE 1993). General information regarding the Hanford Site may be found in the *Hanford Site National Environmental Policy Act (NEPA) Characterization* report (Cushing 1992).

The Hanford Site is known to be rich in cultural resources, and contains many well-preserved archaeological sites dating back to both prehistoric and historical periods. Over 10,000 years of human activity have left extensive archaeological deposits along the Columbia River shoreline and at well-watered inland sites. Archaeological deposits at the Hanford Site have been spared some of the severe disturbances that have befallen unprotected sites in the area. However, the proposed activities would occur in the 200 Areas, several miles from any natural water courses and are not expected to impact sensitive archaeological resources. Further, the 200 Areas have been previously disturbed over the past 50 years. No sensitive cultural resources in the area of the tank farms have been identified, or are anticipated. Additional information regarding the cultural resources on the Hanford Site may be found in the *Hanford Cultural Resources Laboratory Annual Report for 1992* (PNL 1993a).

This page intentionally left blank.

5.0 Environmental Impacts

The following sections present information on those potential environmental impacts that have been identified as a result of activities being proposed for resolution of tank farm USQs and other safety issues. There are uncertainties and risks associated with even the most routine tank farm operations. Also, while gathering and analyzing information required to mitigate and resolve issues surrounding conduct of operations (which are constantly reviewed and evaluated), inherently additional uncertainties (and associated risks) may arise. However, the proposed installation, operation, and removal of the monitoring and sampling equipment, and associated materials discussed previously to address the DOE's Safety Initiatives (Wagoner 1993), would not be expected to result in any additional radiological or hazardous material releases to the environment. All activities would comply with current DOE orders, and state and federal regulations.

5.1 Proposed Actions: Impacts from Routine Operations

The potential for release of radioactive emissions during routine activities in the tank farms exists. However, the primary tank farm ventilation systems (providing filtration of waste tank airborne effluents) would be operational during those activities in order to maintain radioactive emissions well below DOE guidelines (5 roentgen equivalent man [rem] per year), in keeping with As Low As Reasonably Achievable principles. Additionally, appropriate procedures and administrative controls (e.g., personnel training and a Radiation Work Permit) would be in place prior to any proposed activities. Also, radiation and hazardous chemical levels at the waste site, and worker exposure levels, would be monitored during the proposed actions.

There would be some radiological exposure for the workers involved in the proposed activities. However, the anticipated exposure would not result in a change in the average annual exposure to radiation by Hanford Site tank farm workers from ongoing tank farm activities. Average occupational external exposure to workers in the Hanford Site tank farms (as measured by individual dosimetry records) is approximately 14 millirem per year per worker, which is substantially less than the maximum allowable exposure of 5,000 millirem per year.

Assuming 200 tank farm workers are directly involved with the proposed activities and exposed to radiation at the average annual dose rate of 14 mrem per year, based on a dose-to-risk conversion factor of 4.0×10^{-4} (onsite) latent cancer fatalities (LCF) per person-rem (56 FR 23363), 0.001 LCFs per year would be expected to result from the proposed action. It is most likely that no cancer fatalities would be induced by the proposed action during its maximum 8-year duration.

Also, no public exposure to radiation above that currently experienced from Hanford Site operations is anticipated as a result of these actions. That is, as reported in the *Hanford Site Environmental Report 1992*, (PNL 1993b), the potential dose to the hypothetical offsite

MEIs during CY 1992 from Hanford Site operations was 0.02 millirem. The potential dose to the local population of 380,000 persons from 1992 operations was 0.8 person-rem. The 1992 average dose to the population was 0.002 millirem per person. The current DOE radiation limit for an individual member of the public is 100 millirem per year, and the national average dose from natural sources is 300 millirem per year. No adverse health effects would be expected to result from these low doses.

It is anticipated that routine operations would not provide additional exposure of toxic or noxious vapors to workers. Based on experience with Tank 241-C-103 (DOE 1993), additional administrative controls have been put into place (e.g., additional protective equipment, facility access limitation) throughout the tank farms to reduce the potential for worker exposure.

No environmental impacts from the routine transportation of waste samples would be anticipated as a result of the proposed action because the quantities transported would be small and would be appropriately packaged. Most samples would be transported to an appropriate laboratory facility onsite (e.g., 222S Laboratory in the 200 West Area), with selected samples sent to approved laboratories offsite. Typically, a sample of approximately 100 milliliters (0.28 gallons) would be obtained using SOPs. The sample would be packaged into an approved shipping container (e.g., proper shielding, materials of construction), and transported under the prescribed shipping regulations (e.g., DOT) in force at the time.

Small quantities of hazardous materials (e.g., solvents, cleaning agents) which may be generated during the proposed actions would be managed and disposed of in accordance with applicable federal and state regulations. Radioactive material, radioactively-contaminated equipment, and radioactive mixed wastes would be appropriately packaged, stored, and disposed of at existing facilities on the Hanford Site. None of the materials would be anticipated to be generated in substantial quantities when compared to the annual amount routinely generated throughout the Hanford Site. For example, during CY 1992, 23,800 cubic meters (840,489 cubic feet) of low-level nonindustrial waste was received for disposal and/or storage in the 200 Areas (WHC 1993b).

Noise levels would be comparable to existing conditions in the tank farms. The amount of equipment and materials to be used, such as steel and other metals for piping and enclosures necessary for modifications, represent a minor long-term commitment of nonrenewable resources.

5.2 Proposed Actions: Impacts from Accidents

A wide range of postulated accidents associated with Hanford Site tank farm operations have been previously analyzed in EISs (ERDA 1975, DOE 1983, DOE 1987 [supported by PNL 1986]), and in several EAs (DOE 1991d, DOE 1992c, and DOE 1993). The EA accidents are summarized in Appendix B, and are briefly discussed below in Sections 5.2.1, 5.2.2, and 5.2.3, with a complete reference listing provided in Section 8.0.

The events included high consequence/low probability scenarios, as well as low consequence/high probability scenarios. The most serious postulated event analyzed was a gas ignition and detonation. Although the consequences of such an event would be catastrophic, the probability of such an occurrence is extremely low, and therefore the overall risk is small.

The proposed activities are similar to those safely conducted in the past and analyzed in existing EAs (Table 1). The accident analyses associated with these similar activities were described in the previous EAs (Table 1) and are expected to bound the potential accidents that could occur from the proposed activities evaluated in this EA because in any particular category of safety issue, similar accident initiators and potential risks would be present.

9413273.0385

Over the past 2 years (1991 to 1993), major intrusive activities associated with Tank 241-SY-101 (e.g., core drilling, auger sampling, mixer-pump installation and operation), along with relatively minor actions (e.g., installation of video cameras, gas monitoring systems) have required entering tank containment 15 to 20 times. No unanticipated events directly associated with those proposed actions have occurred. Similar activities are scheduled (Appendix A) to address the spectrum of tank safety issues. The DOE will constantly review appropriate procedures and related information to mitigate the potential for future unanticipated events.

5.2.1 Unreviewed Safety Question-Flammable Gas Tanks

Accident scenarios specifically addressing the hydrogen issue in Tank 241-SY-101 have been analyzed previously for the installation, operation, and removal of in-tank monitoring equipment, minor modifications to ventilation systems, and sampling of vapors and wastes (DOE 1990, DOE 1991b, DOE 1991c, DOE 1991d, DOE 1992b, DOE 1992c). Similar initiators and risks are present in all tanks. A summary of those accident analyses is presented in Appendix B. It would be anticipated that other flammable gas tanks would have similar initiators and potential accidents (with attendant probabilities). However, due to lower gas generation and retention rates, the associated risks would be lower.

The non-detonation accident sequences previously analyzed (Table 1) included potential material spills, equipment drops, unfiltered releases from open risers, and a range of potential ignition scenarios that would not result in a detonation (Section 5.2.7, Maximum Reasonably Foreseeable Accident). Similar hazards, initiators, and probabilities would be anticipated for other flammable gas tanks associated with the proposed actions. The estimated offsite LCFs that could result from radiological releases associated with the non-detonation accident scenarios vary with the accident sequence from 1.5×10^{-5} (for a spill during removal, with estimated annual probability of occurrence of 5.0×10^{-3}) to 3.4×10^{-2} (for a gas ignition, with estimated annual probability of occurrence of 1.0×10^{-7}). These correspond to population doses of 0.03 and 68 person-rem, respectively. The corresponding doses to individual tank farm workers would range from about 6 millirem (spill) to about 13 rems for the ignition scenario (2.4×10^{-6} and 5.2×10^{-3} LCFs, respectively).

No future onsite or offsite health effects from exposure to toxic gases (including throat or eye irritation) during any postulated accident sequence would be expected. The maximum exposures to the species of greatest concern, ammonia (estimated to be approximately 1.3 percent), would be only slightly above the immediately dangerous to life and health level (i.e., 500 parts per million) and the exposures would only be for several minutes (DOE 1992c). Other toxic gas species are well below acceptable limits. Also, the previously mentioned incidents (Section 2.5) have resulted in additional administrative controls (e.g., protective clothing) to mitigate the potential for future events throughout the tank farms.

5.2.2 Unreviewed Safety Question-Ferrocyanide Tanks

Accident scenarios specifically addressing the ferrocyanide issue have been analyzed previously for the installation, operation, and removal of in-tank monitoring equipment and sampling of vapors and wastes (DOE 1987, DOE 1991e, DOE 1992d, and DOE 1992e), and their associated FONSIs. Similar hazards and initiators are present in all tanks. A summary of those accident analyses is presented in Appendix B.

The potential accident scenarios evaluated included a vapor space fire, salt cake combustion, and a sample container drop outside the tank. As stated in the *Environmental Assessment: Intrusive Sampling and Testing of Ferrocyanide Tanks* (DOE 1992d), the consequences of a spark-caused fire and/or a salt cake combustion due to impact as a result of the proposed actions could be catastrophic. The probability that the proposed actions would result in a spark or impact induced fire or combustion is extremely low (approximately 1.0×10^{-9} per year).

A toxic gas release scenario also was discussed (DOE 1992d). As stated in that EA, the low annual probability of such a release, the protection to workers afforded by gas monitoring in the work environment, and appropriate procedures and equipment for worker safety, resulted in the expectation that risks associated with the postulated accident scenario would be low.

5.2.3 Unreviewed Safety Question-Floating Organic Solvent Layer Tank

Postulated accident scenarios associated with vapor and liquid characterization of the floating organic solvent layer in Tank 241-C-103 were analyzed in the *Environmental Assessment: Tank 241-C-103 Organic Vapor and Liquids Characterization and Supporting Activities,* (DOE 1993) and its FONSI. This EA analyzed a range of reasonably foreseeable accidents, including a noxious or toxic gas release, a dip-sample bottle break outside the tank, radiation exposure from a gas sampling tube, a lightning strike that ignites organic vapors in the tank, and a vapor space fire, and subsequent burn of the liquid organic layer in the tank. A summary of those accident analyses is presented in Appendix B. The accident with the highest probability of occurrence is the dip-sample bottle break, which would increase worker exposure to radiation, but would not be expected to result in any adverse health effects. Additionally, the postulated noxious or toxic gas release would not result in any adverse health effects to workers or the public.

The activities associated with the proposed transfer and storage of the liquid organic layer would be not pose any unique risks or safety hazards. The potential consequences and risks of accidents for the proposed transfer and storage would be no greater than those presented in *Environmental Assessment: Tank 241-C-103 Organic Vapor and Liquids Characterization and Supporting Activities* (DOE 1993). The probability of a severe accident would be less than 1.0×10^{-6}; the consequences could be catastrophic.

9413273.0387

5.2.4 Toxic Vapors

An analysis of potential accidental emissions (which include hydrogen, oxides of nitrogen, and ammonia) indicated that the probability of a gas release during operations associated with Tank 241-SY-101 would be 1.0×10^{-4} (DOE 1992b). The maximum reasonably foreseeable case of toxic emissions would occur from Tank 241-C-103 (DOE 1993). As shown in Appendix B, the consequences were that the noxious or toxic gas release would not result in life-threatening health effects to workers due to limiting personnel access, the use of protective clothing, and supplied air in the vicinity of the sampling, and would have no impact on the public. Potential exposure to workers by vapors from other USTs would be mitigated by extending the administrative controls and procedures presently established for Tank 241-C-103.

5.2.5 Infrastructure Upgrades

As shown in Appendix B, the risks associated with past infrastructure upgrade activities have been investigated (DOE 1991c, DOE 1992b, DOE 1992c and DOE 1992e). Included activities are ventilation and equipment upgrades, and installation of instrument measuring and control systems. Hazards and accident scenarios have been identified, and the frequency and consequence of anticipated accidents were examined. The results indicate that both the frequency and consequences of postulated accidents are low. No hazards or potential accident scenarios associated with the proposed actions could be identified that would be substantially different than those previously examined.

5.2.6 Interim Stabilization of Single-Shell Tanks

The potential accidents associated with interim stabilization of SSTs have been examined (WHC 1993c). The most significant accidents include breaks in waste transfer and pumping systems, and hydrogen accumulation and ignition in interim receiver tanks. The estimated offsite LCFs that could result from radiological releases associated with these accidents are 7.0×10^{-8} (for pumping system breaks) and 1.5×10^{-5} (for hydrogen ignition). The onsite LCFs, which could result from the same accident, were estimated to be 1.7×10^{-4}

and 8.0×10^{-4}, respectively. The corresponding doses for the pumping system break are $4.4. \times 10^{-2}$ rem for the onsite worker and 1.4×10^{-4} rem for the offsite MEI. The doses for the hydrogen ignition accident are 2.0 rem for the onsite worker and 3.0×10^{-2} rem for the offsite MEI. The probabilities for the pumping system break and hydrogen accumulation and ignition were calculated to be 1.4×10^{-3} and between 1.0×10^{-2} and 1.0×10^{-4}, respectively.

5.2.7 Maximum Reasonably Foreseeable Accident

A postulated detonation event in Tank 241-SY-101 would be considered the maximum reasonably foreseeable accident. The impacts of this activity have been evaluated (DOE 1992c). As discussed in Appendix B, this event is considered highly unlikely, based on the estimated probability of less than 1.0×10^{-6} per year (under current conditions). The pressures from such a detonation would exceed, by a factor of two or more, the pressures that have been found to be structurally limiting in Tank 241-SY-101. This means that a detonation, should it occur, would be expected to cause tank failure. The consequences of a detonation event in Tank 241-SY-101 would be similar to the ferrocyanide explosion evaluated in the *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (HDW-EIS) (DOE 1987). The ferrocyanide event would result in a short-term radiation dose to the offsite MEI of 200 millirem, and an offsite collective dose commitment of 7,000 person-rem. Such an explosion would be expected to result in 4 offsite LCFs, the contamination of a substantial area of land, and large doses to workers. Although a 1990 General Accounting Office (GAO) study estimated that the consequences of this event would be 10 to 100 times greater than those projected in the HDW-EIS (GAO 1990), the GAO did not reach a conclusion regarding the probability of a tank explosion, and an independent DOE review determined that the probability of such an event is low (Duffy 1990). The proposed actions would not appreciably increase the probability of a gas detonation event. Further, the mitigation of hydrogen evolution by operation of a mixer-pump would reduce the probability and risk of such an event. Based on the extremely low probability of occurrence, even if the severe consequences of the GAO report are assumed, the risks of a tank detonation resulting from the proposed actions are small.

5.3 Alternative Actions

5.3.1 No-Action Alternative

The No-Action Alternative would have no greater environmental impacts than those presently experienced at the Hanford Site (PNL 1993b). However, the lack of information and data could hamper the ability to resolve USQs and other safety concerns in a timely manner. This could result in increased long-term risk to the workers, public and the environment.

Activities conducted under this alternative would be expected to have environmental impacts similar to those currently experienced at the Hanford Site. As discussed in the *Hanford Site Environmental Report 1992*, (PNL 1993b), liquid and gaseous effluents, which may contain radioactive and hazardous constituents, are continually monitored at the Hanford Site. The specific constituents monitored are selected based on applicability (e.g., constituents would be considered for tank farm operations). The potential dose to the hypothetical offsite MEI in 1992 from Hanford operations was 0.02 millirem (PNL 1993b), the same as calculated for 1991. The potential dose to the local population of 380,000 persons from 1992 operations was 0.8 person rem, compared to 0.9 person rem reported for 1991. The 1992 average dose to the population was 0.002 millirem. The offsite MEI potentially received 0.02 percent of the DOE dose limit and 0.007 percent of the national average background dose from natural sources. The average individual potentially received 0.002 percent of the standard and 0.007 percent of the 300 millirem per year received from typical natural sources.

The highest dose rates measured in the 200 Areas would continue to be near waste-handling facilities, such as tank farms. The average dose rate measured in 1992 at the perimeter of the tank farms by thermoluminescent dosimeters was 130 millirem per year (representing 24 hours per day, 365 days per year), which was 8 percent above the average dose rate of 120 millirem per year measured in 1991 (PNL 1993b).

Additionally, air samples were collected for volatile organic compounds and polychlorinated biphenyls. All measured air concentrations of these organic compounds were well below applicable maximum allowable concentration standards for air contaminants. Further, chemical water quality constituents measured in Columbia River water during 1992 were generally similar upstream and downstream and in compliance with applicable standards (PNL 1993b).

5.3.2 Non- and Minimal-Intrusive Alternatives

These alternatives would be expected to contribute less worker and offsite exposure. As in the No-Action Alternative, the lack of information and data could hamper the ability to resolve USQs and other safety concerns in a timely manner. This could result in increased long-term risk to the worker, public, and environment.

5.4 Proposed Actions: Cumulative Impacts

While the increased number of intrusive actions proposed would slightly increase accident risks in the short-term, the accident risks would remain small. The proposed actions actually would contribute to an overall decrease in the potential risks associated with routine Hanford Site tank farms operations. Enhanced monitoring capability, improvements to ventilation systems, knowledge of tank waste composition and characteristics, and infrastructure upgrades would minimize the potential for unnecessary exposures to workers and the public. Thus, this would contribute to a near-term reduction from the 1992 tank farm perimeter dose rate of 130 millirem per year, and the average 1992 worker dose rate of 14 millirem.

The proposed actions also would mitigate the potential for, and consequences of, inadvertent releases of radioactive and hazardous materials from USTs. Mixer-pump installation and operation would reduce buildup of flammable gas mixtures. Removal of the floating organic solvent layer would substantially reduce the source term, should a postulated ignition occur in Tank 241-C-103.

6.0 Permits and Regulatory Requirements

The SSTs and DSTs are being operated under interim status as treatment and storage units under *Washington Administrative Code* (WAC 173-303). An amended dangerous waste closure and postclosure plan would be submitted to Ecology for closure of the SSTs (Tri-Party Agreement Milestone M-9-02 [Ecology et al. 1992]).

Notification and approval from the appropriate regulatory authorities would be required prior to installation of mixer pumps or sluicing pumps. The DOH notification and/or approval may be required due to the potential increase in radionuclide air emissions. Additionally, approvals also may be required by EPA and Ecology. All required approvals would be obtained prior to the initiation of a particular activity.

This page intentionally left blank.

7.0 Agencies Consulted

No outside agencies were consulted regarding the preparation of this EA.

This page intentionally left blank.

8.0 References

50 CFR 17, 1992, "Endangered and Threatened Wildlife and Plants," *Code of Federal Regulations*, as amended.

54 FR 12440, 1988, "Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision, *Federal Register*, April 14.

56 FR 23360, 1991, ""Nuclear Regulatory Commission, Preamble to Standards for Protection Against Radiation," *Federal Register*, May 21.

Cushing, C. E., ed., 1992, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev. 5, Pacific Northwest Laboratory, Richland, Washington.

DOE, 1980, *Final Environmental Impact Statement, Supplement to ERDA-1538, December 1975, Waste Management Operations, Hanford Site, Richland, Washington, Double-Shell Tanks for Defense High-Level Radioactive Waste Storage*, DOE/EIS-0063, U.S. Department of Energy, Washington, D.C.

DOE, 1983, *Addendum to the EIS: Operation of PUREX and Uranium Oxide Plant Facilities, Hanford Site, Richland, Washington*, DOE/EIS-0089, U.S. Department of Energy, Washington, D.C.

DOE, 1987, *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington*, 5 vols, DOE/EIS-0113, U.S. Department of Energy, Washington, D.C.

DOE, 1989, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

DOE, 1990, *Environmental Assessment: Collecting Crust Samples from Level Detectors in Tank 101-SY at the Hanford Site*, DOE/EA-0479, U.S. Department of Energy, Richland, Washington.

DOE, 1991a, *Unreviewed Safety Questions*, DOE Order 5480.21, U.S. Department of Energy, Washington, D.C.

DOE, 1991b, *Environmental Assessment: Characterization of Tank 241-SY-101, Hanford Site, Richland, Washington*, DOE/EA-0511, U.S. Department of Energy, Richland, Washington.

DOE, 1991c, *Environmental Assessment: Upgrading of the Ventilation system at the 241-SY Tank Farm, Hanford Site, Richland, Washington*, DOE/EA-0581, U.S. Department of Energy, Richland, Washington.

DOE, 1991d, *Environmental Assessment: Preparation for Crust Sampling of Tank 241-SY-101, Hanford Site, Richland, Washington*, DOE/EA-0495, U.S. Department of Energy, Richland, Washington.

DOE, 1991e, *Environmental Assessment: Vapor Space Sampling of Ferrocyanide Tanks, Hanford Site, Richland, Washington*, DOE/EA-0533, U.S. Department of Energy, Richland, Washington.

DOE, 1992a, *U.S. Department of Energy High-Level Waste Storage Tank Safety Issues Report*, Rev. 4, DOE High-Level Waste Tank Working Group, November 30, U.S. Department of Energy, Washington, D.C.

DOE, 1992b, *Environmental Assessment for Tank 241-SY-101 Equipment Installation and Operation to Enhance Tank Safety*, DOE/EA-0802, U.S. Department of Energy, Washington, D.C.

DOE, 1992c, *Environmental Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101*, DOE/EA-0803, U.S. Department of Energy, Washington, D.C.

DOE, 1992d, *Environmental Assessment: Intrusive Sampling and Testing of Ferrocyanide Tanks, Hanford Site, Richland, Washington*, DOE/EA-0596, U.S. Department of Energy, Washington, D.C.

DOE, 1992e, *Environmental Assessment: Thermocouple Tree System Installation and Operation in Non-Leaking Ferrocyanide Tanks*, DOE/EA-0809, U.S. Department of Energy, Richland, Washington.

DOE, 1993, *Environmental Assessment: Tank 241-C-103 Organic Vapor and Liquids Characterization and Supporting Activities, Hanford Site, Richland, Washington*, DOE/EA-0881, U.S. Department of Energy, Richland, Washington.

Duffy, L. P., 1990, "Ferrocyanide Studies," (Memorandum to J. D. Wagoner, October 3), U.S. Department of Energy, Washington, D.C.

Ecology, EPA, and DOE, 1992, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

ERDA, 1975, *Final Environmental Statement: Waste Management Operations, Hanford Reservation, Richland, Washington*, 2 vol., ERDA-1538, U.S. Energy Research and Development Administration, Washington, D.C.

GAO, 1990, *Consequences of Explosion of Hanford's Single-Shell Tanks are Understated*, GAO/RCED-91-34, U.S. General Accounting Office, Washington, D.C.

Harmon, H. D., 1993, "Planned Work Activities for Tank 241-SY-103," (Memorandum to J. H. Anttonen, Letter 9304164B R1, October 5), Westinghouse Hanford Company, Richland, Washington.

NCHS, 1988, *Vital Statistics of the United States 1985, Volume II - Mortality*, National Center for Health Statistics, U.S. Department of Health and Human Services, Hyatsville, Maryland.

PNL, 1986, *Potential Radiological Impacts of Upper-Bound Operational Accidents During Proposed Disposal Alternatives for Hanford Defense Waste*, PNL-5356, Pacific Northwest Laboratory, Richland, Washington.

PNL, 1993a, *Hanford Cultural Resources Laboratory Annual Report 1992*, PNL-8676, Pacific Northwest Laboratory, Richland, Washington.

PNL, 1993b, *Hanford Site Environmental Report 1992*, PNL-8682, Pacific Northwest Laboratory, Richland, Washington.

Public Law 101-510, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*, 42 U.S.C. 7274, et seq., November 5, 1990.

WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

Wagoner, J. D., 1993, "Secretary of Energy's Safety Initiatives," (Memorandum to T. P. Grumbly, Letter TWS:DJS 93-TWS-043, November 1), Westinghouse Hanford Company, Richland, Washington.

WHC, 1993a, *Quarterly Report on Defense Nuclear Facilities Safety Board Recommendation 90-7 for the Period Ending March 31, 1993*, WHC-EP 04748, Westinghouse Hanford Company, Richland, Washington

WHC, 1993b, *Summary of Radioactive Solid Waste Received in the 200 Areas During Calendar Year 1992*, WHC-EP-0125-5, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993c, *Safety Assessment for Interim Stabilization of Ferrocyanide Tanks*, WHC-SD-WM-SAD-018, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

Figures

This page intentionally left blank.

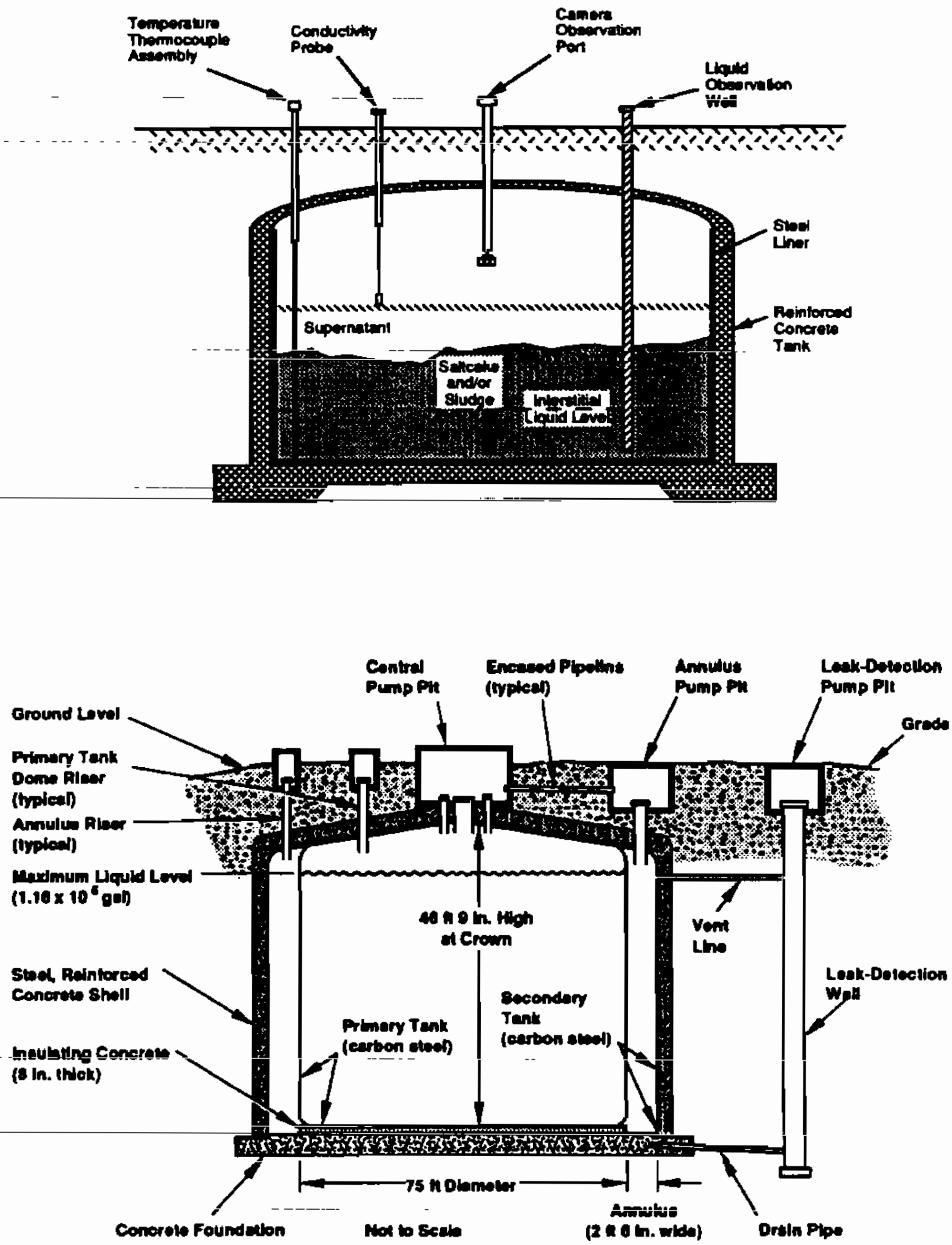

Figure 1. Single-Shell and Double-Shell Tank Configurations.

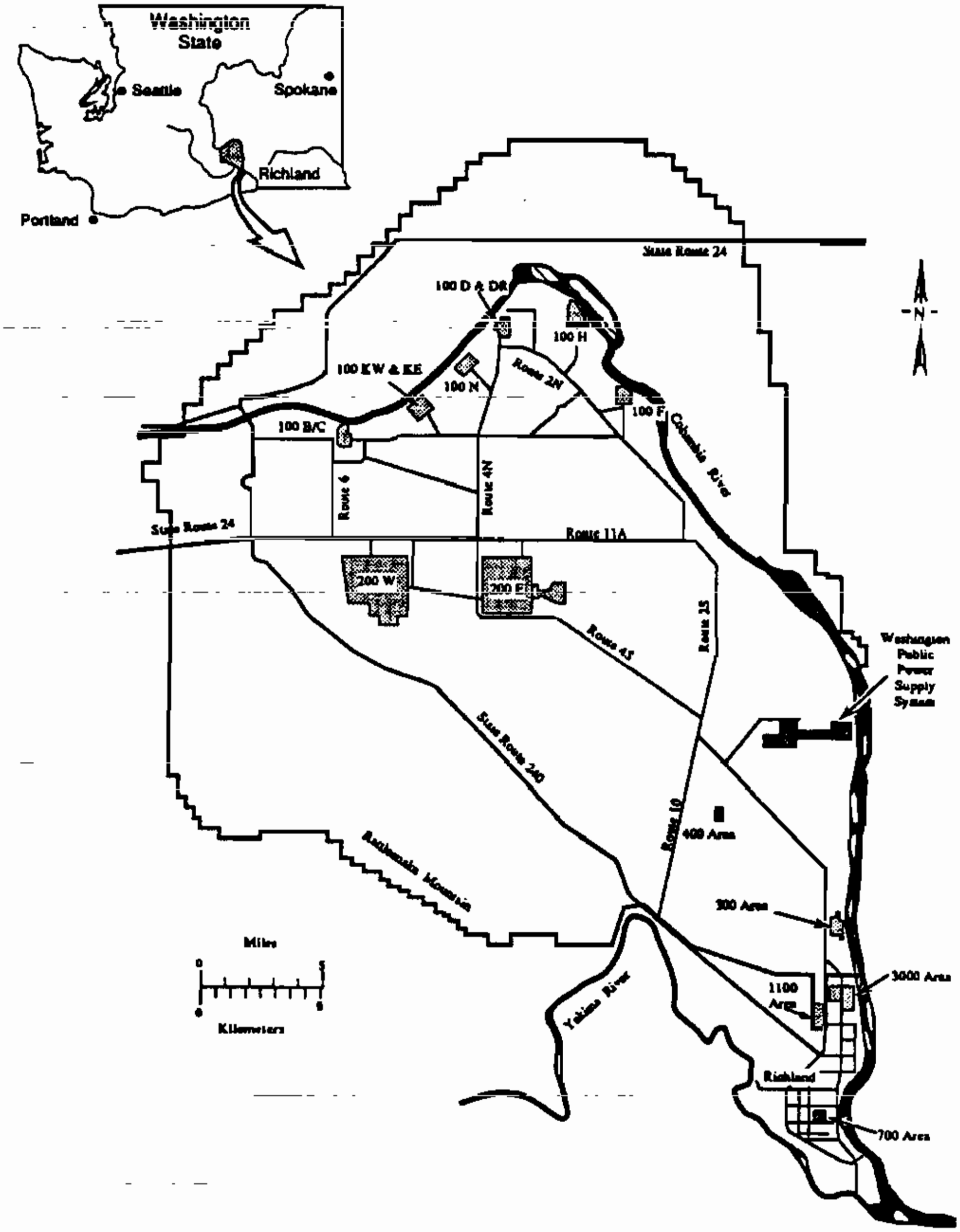

Figure 2. Hanford Site.

Projected Tank Farm Safety Activities, Hanford Site, Richland, Washington

This page intentionally left blank.

9413273.0405

Projected Tank Farm Activities
Hanford Site, Richland, Washington

Activities	Fiscal Year/Number of Tanks							
	1994	1995	1996	1997	1998	1999	2000	2001
Flammable Gas Tanks								
1. Install mixer pumps		1	2	1	1		1	
2. Install standard hydrogen monitors	14	9						
3. Install ammonia monitors	3	3						
4. Take auger samples	2							
5. Install surface-level devices	3	3						
6. Remove specific gravity probe	1							
7. Install video cameras	3	2	1					
8. Install Multi-Function Instrument Trees	2	2	1					
9. Install ventilation upgrades	3	7						
10. Deploy retained gas sampler		2	2	2				
11. Install void fraction meter	1							
12. Install multi-port riser	1							
Ferrocyanide Tank								
1. Vapor sample for thermocouple installation	15							
2. Install thermocouple trees	9	3						
3. Neutron probe support	1							
4. Install moisture monitoring upgrades		6	12					
5. Perform infrared scanning					18			

Projected Tank Farm Safety Activities
Hanford Site, Richland, Washington

Activities	Fiscal Year/Number of Tanks							
	1994	1995	1996	1997	1998	1999	2000	2001
Organic Tanks								
1. Dip sample Tank 241-C-103	1							
2. Vapor sample for thermocouple installation	6	3						
3. Install thermocouple trees	4	5						
4. Remove liquid organic layer		1						
5. Take auger sample		1						
High-Heat Tank								
1. Install video camera		1						
Toxic Vapors								
1. Flammability sampling for Tank 241-C-103	1							
2. Nitrile sampling	1							
3. Vapor sampling	17	19						
4. Install vapor treatment system		1						
Nuclear Criticality								
1. Install nuclear criticality monitoring equipment					1	2		
Hydroxide Control								
1. Install pH probe in Tank 241-AN-107	1							
2. Install video camera in Tank 241-AN-107	1							
3. Install caustic injection and mixer pump	1							

**Projected Tank Farm Safety Activities,
Hanford Site, Richland, Washington**

Activities	Fiscal Year/Number of Tanks							
	1994	1995	1996	1997	1998	1999	2000	2001
1. Push-mode core samples	6	15	36					
2. Rotary core samples	6	32	28					
3. Auger samples	12	8	6					
4. Grab samples	20	30	30					

This page intentionally left blank.

Accident Scenario Consequence Conclusions from Finding of No Significance Impact Determinations

This page intentionally left blank.

Accident Scenario Consequence Conclusions from Finding of No Significance Impact Determinations

***Environmental Assessment: Collecting Crust Samples from Level Detectors in Tank 101-SY at the Hanford Site*, DOE/EA-0479, U.S. Department of Energy, Richland, Washington (DOE 1990).**

Based on the analyses provided in the Safety Evaluation, the U.S. Department of Energy has concluded that the likelihood of an accident would be low based on past experience. The offsite whole body doses due to a postulated bounding accident would be less than 3 roentgen equivalent man (rem). Exposure to operators equipped with the required respiratory protection would result in doses less than 5 rem. Therefore the accident risk posed by the proposed actions is small. In addition, operating conditions would be imposed, which would further lessen the doses from, or likelihood of, an accident.

9417327.0411

***Environmental Assessment: Characterization of Tank 241-SY-101, Hanford Site, Richland, Washington*, DOE/EA-0511, U.S. Department of Energy, Richland, Washington (DOE 1991b).**

Dose consequences were calculated for a variety of reasonably foreseeable accident scenarios. Based on tests conducted using simulated tank contents, auger sampling of the crust would result in temperatures well below that necessary to cause a secondary crust reaction. The analysis concludes that a crust reaction would not occur in this scenario. For the remaining scenarios, the consequence analysis assumes that only minor crust reaction would occur. In a postulated scenario involving ignition of dome space gas in Tank 241-SY-101, while obtaining a sample, the maximum dose to workers involved with the proposed action was 11 rem Effective Dose Equivalent (EDE), and the maximum doses elsewhere onsite and offsite EDE were 0.75 rem and 1.2 x 10^{-3} rem, respectively. The consequences of other postulated accidents are bounded by this scenario.

***Environmental Assessment: Upgrading of the Ventilation system at the 241-SY Tank Farm, Hanford Site, Richland, Washington*, DOE/EA-0581, U.S. Department of Energy, Richland, Washington (DOE 1991c).**

The most significant hazard is the potential for a gas release from Tank 241-SY-101 during the installation process that could contain up to 1.3 percent (volume) ammonia in the immediate vicinity of the tank, (i.e., in gas that might potentially be released through a tank riser, such as 7B, into the work area above the dome, while the portable exhauster is being replaced by the filtered air inlet). This concentration, if inhaled, could result in a "high mortality rate" per the National Research Council Subcommittee on Ammonia. The number of workers in the work area would be minimized in accordance with As Low As Reasonably Achievable.

Environmental Assessment: Vapor Space Sampling of Ferrocyanide Tanks, **DOE/EA-0533, U.S. Department of Energy, Washington, D.C. (DOE 1991d).**

A review of the proposed actions was provided in a Safety Assessment (SA) to determine if a spark or static buildup, crust disturbance, or contamination spread could occur. Evaluations included determining the potential for loss of ventilation, a gas release event occurring during sampling, a spark being introduced during the insertion of the gas monitoring probes, a heated probe surface due to friction, unintended drop of the samplers, sampling causing a gas release event, and others. Consequences for each of these hazards were discussed and it was concluded that the likelihood of any of these occurrences range from 1.0×10^{-2} to 1.0×10^{-6}. The onsite and offsite whole body doses due to a postulated severe accident were less than 1 millirem. The operator doses are no more than 45 millirem (assuming no respiratory protection. Therefore the risk posed by this operation is considered to be very small).

***Environmental Assessment: Vapor Space Sampling of Ferrocyanide Tanks, Hanford Site, Richland, Washington*, DOE/EA-0533, U.S. Department of Energy, Richland, Washington (DOE 1991e).**

Four potential accident scenarios that could occur during conduct of the proposed action and could result in a release of radioactive material were considered. These scenarios include (1) a vapor space fire; (2) saltcake combustion; (3) ferrocyanide reaction; and (4) contamination of the sampling assembly. The probabilities for these events to occur and result in radioactive releases as a result of the proposed action were calculated, to be less than 1.0×10^{-7}, 1.0×10^{-8}, 1.0×10^{-8}, and 1.0×10^{-6}, respectively. The potential consequences of a vapor space fire, saltcake combustion, and ferrocyanide reaction could be catastrophic. These consequences, however, would be the same or less than those of a ferrocyanide explosion (Section 5.2.7, Maximum Reasonably Foreseeable Accident).

It is possible for a gas release event to occur during a "window," although it is estimated that approximately one-half of the tank gas inventory is vented during the major release event that precedes the relatively quiescent "window" period. Thus, the gas release volume is expected to be much smaller if it occurs during a window, with a corresponding reduction in radiological release and ammonia concentration. The value of 1.3 percent ammonia is stated as a maximum tank dome concentration in the unlikely event of a gas release during window operations, and is derived from tank ventilation-dilution of a computed maximum of 4 percent ammonia that might emanate from the tank surface in a major release.

As discussed in the SA for this operation, all operating personnel in the vicinity of the tank farm would be equipped with respirators and other safety equipment. Offsite consequences were not specifically calculated because they would be substantially less than onsite consequences (i.e., greater than 100 meters (328 feet) from the tank farm) which were found to be minimal.

The other hazard is the potential for spark generation in the riser due to installation activities (caused by removal of the riser cap or installation of the temporary covers) that could ignite hydrogen during a tank venting occurrence. The probability of a spark igniting hydrogen in a riser is 1.0×10^{-7} per year. If this event should occur, the operator EDE would be less than 45 millirem, and doses to maximally exposed individuals (MEI), both onsite and offsite, would be less than 1 millirem. It should be understood that this scenario only postulates a local accumulation of hydrogen in the riser itself as the high point in the tank dome. The bulk of the vapor space is below the flammability limit as shown by the online hydrogen monitor in the ventilation exhaust line (i.e., the riser would not be opened unless this were the case). In addition, upon removal of the riser cap, hydrogen would be purged from the riser by in-flowing air due to the negative pressure normally maintained in the dome space. The riser cover would be bonded to the tank to prevent static charges. Only spark-resistent tools would be used except for the initial loosening (not removing) of the bolts and the final tightening of the bolts.

A second potential for spark generation occurring as a result of working on a riser would be the dropping of a tool into the tank. Based on extremely conservative set of assumptions regarding impact energy concentration and local accumulation of flammable gas, two release scenarios were evaluated. The worker dose consequences from these dropped object scenarios were 45 millirem and 5 millirem, respectively. The corresponding onsite and offsite MEI doses were both estimated at less than 1 millirem.

If, during installation, the riser for the inlet filter or the exhaust header was left open too long while flow also was entering the tank through the inlet flow paths in the pump pit, the tank pressure may reach atmospheric pressure. This also was possible if the backup exhaust fan fails while the exhaust header work is being performed. The worker dose would be less than 5 millirem, and the onsite and offsite MEI dose would be less than 1 millirem.

***Environmental Assessment for Tank 241-SY-101 Equipment Installation and Operation to Enhance Tank Safety*, DOE/EA-0802, U.S. Department of Energy, Washington, D.C. (DOE 1992b).**

The Environmental Assessment (EA) analyzed a variety of reasonably foreseeable accidents that could occur as a result of the proposed action. The major concerns are related to potential worker exposure to radioactivity or toxic gases, and to the potential for spark generation resulting in ignition of flammable gas and subsequent release of radioactivity.

The risks associated with worker exposure to toxic gases, such as ammonia, are very small because the probability of toxic gas release during a window is small (annualized probability of 1.0×10^{-4}), and because immediately dangerous concentrations of toxic gases would not occur. Workers near the tank would be wearing protective respiratory equipment that would further minimize the risk.

The consequences of dropping equipment outside the tank also were considered in the EA. The onsite MEI would receive an EDE of 2.2 rems; other workers onsite would receive a maximum dose of 1.5 x 10^{-2} rem; and the maximum dose to an individual offsite would be 2.3 x 10^{-5} rem. No adverse health effects would be expected to result from this accident. The annualized probability that such an equipment drop would occur is estimated as 1.0 x 10^{-4}.

The risks associated with an accident resulting in a gas ignition and burn during the proposed action with the ventilation system operable also were analyzed, and would be small. The annualized probability that this event would occur is estimated as 3.6 x 10^{-6}. The doses from such an accident would be an EDE of 3.9 rem to a worker in the 241-SY Tank Farm and 0.0013 rem to the offsite MEI. No latent cancer fatalities (LCF) would be expected to result. Ammonia gas releases would be minimal. The risks associated with accident sequences involving a gas ignition and burn during a period when the ventilation system is inoperable were considered in the EA, and would be extremely low because the estimated probability of occurrence is on the order of 1.0 x 10^{-10} and the resulting doses would be similar to those estimated for a burn with the ventilation system operable (Section 5.2.7, Maximum Reasonably Foreseeable Accident).

9413273.0419

***Environmental Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101*, DOE/EA-0803, U.S. Department of Energy, Washington, D.C. (DOE 1992c)**

A wide range of reasonably foreseeable accidents that would not result in a gas detonation were considered and analyzed in the EA and SA. The consequences of a gas detonation were considered in the EA but not quantified in the SA, and would be significantly greater than the consequences for the other scenarios considered in the EA and SA. A gas detonation would be the maximum reasonably foreseeable accident (Section 5.2.7, Maximum Reasonably Foreseeable Accident).

The non-detonation accident sequences analyzed included potential material spills, equipment drops, unfiltered releases from open risers, and a range of potential ignition scenarios that would not result in a detonation. Based on a conversion factor of 5.0 x 10^{-4} LCF per person-rem, the estimated offsite LCF that could result from radiological releases associated with the non-detonation accident scenarios vary with the accident sequence from 1.5 x 10^{-5} (for a spill during removal, with estimated annual probability of occurrence of 5.0 x 10^{-3}) to 3.4 x 10^{-2} (for a gas ignition, with estimated annual probability of occurrence of 1.0 x 10^{-7}), corresponding to population doses of 0.03 and 68 person-rem, respectively. The corresponding exposures to individual tank farm workers would range from about 6 millirem for the spill-during-removal scenario (largest probability of occurrence) to about 12.5 rems for the ignition scenario. The respective probabilities of inducing a LCF associated with these individual exposures are 3 x 10^{-6} and 6 x 10^{-3}.

As indicated, the accident sequence with highest probability of occurrence would be a small accidental spill of radioactive liquids during equipment removal and flushing activities. However, because of the non-volatile form of the radionuclides, such a spill would not constitute an airborne hazard to workers outside the immediate area of the spill. Workers in the immediate area would be protected with anti-contamination clothing and breathing filters, and would immediately cleanup any spill using established tank farm practices.

No onsite or offsite health effects are expected to result from exposure to toxic gases during any of these accident sequences because the maximum exposures to the species of greatest concern, ammonia, would be only slightly above the health threatening level (i.e., 500 parts per million) and the exposures would be short (several minutes).

The maximum reasonably foreseeable accident sequence is the highly unlikely gas detonation event with an estimated probability of occurrence of less than 1.0×10^{-6} per year under current conditions. The gas detonation accident sequence discussed below could occur independently of the proposed action. The proposed action has the potential to slightly increase the likelihood that the gas detonation accident sequence would occur because the pump could generate a larger gas release than would be expected for the no action alternative. Although the DOE cannot quantify the probability of a larger gas release, the probability of a detonation of such a release would remain highly unlikely. The relative probability of a detonation, between the proposed action and the no action alternative, depends on the likelihood of the pump test succeeding in limiting the hydrogen concentration in the tank dome space to below the lower flammability limit (LFL) during the pump test. DOE conceived and designed the proposed pump mixing test with the expectation that it would be successful in limiting flammable gas concentrations, but this likelihood cannot be quantified in absolute terms at this time. Failure of the pump to limit hydrogen concentrations to below the LFL would not necessarily result in an increased probability of a detonation.

The EA indicates that the pressures resulting from a detonation could exceed, by a factor of two or more, the pressures that have been found to be structurally limiting in Tank 241-SY-101. This means that a detonation, should it occur, could be expected to cause tank failure and result in consequences more severe than those discussed above for the non-detonation scenarios.

The *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (HDW-EIS) projected that the maximum reasonably foreseeable accident associated with the High-Level Waste (HLW) management operations would be an explosion of a ferrocyanide-containing waste tank. The risks associated with an explosive detonation of flammable gas in Tank 241-SY-101 are similar to those estimated for the maximum reasonably foreseeable accident in the HDW-EIS in that there is a very low likelihood of occurrence, and, although there is uncertainty regarding the consequences, the consequences would be catastrophic.

The HDW-EIS projected that a HLW tank explosion would result in a short-term radiation dose to the maximally exposed member of the public of 200 millirem, and an offsite collective dose commitment of 7,000 person-rem. Such an explosion would be expected to result in 4 offsite LCFs, the contamination of a substantial area of land, and significant doses to workers.

However, a 1990 General Accounting Office (GAO) study estimated that the consequences of this event could be 10 to 100 times greater than those projected in the HDW-EIS. Although the GAO study did not reach a conclusion regarding the probability of a tank explosion, an independent DOE expert review panel judged the probability of such an explosion to be low.

***Environmental Assessment: Intrusive Sampling and Testing of Ferrocyanide Tanks, Hanford Site, Richland, Washington*, DOE/EA-0596, U.S. Department of Energy, Washington, D.C. (DOE 1992d).**

Four potential accident scenarios associated with the conduct of the proposed actions were considered. These scenarios, along with the annual probability of occurrence associated with each postulated accident are: (1) spark-caused fire (1.0×10^{-9}); (2) salt cake combustion due to impact (1.0×10^{-9}); (3) toxic gas release (1.0×10^{-5}); and (4) sample container drop outside tank (1.0×10^{-4}). The consequences of a spark-caused fire and/or a salt cake combustion due to impact as a result of the proposed action could be potentially catastrophic. However, similar consequences (and conclusions) regarding these consequences were reached in this Environmental Assessment, and are addressed in Section 5.2.7.

In the scenario involving the drop of the sample container outside of the tank, the SA calculated a probability of 1.0×10^{-4} of spilling the sample contents. In estimating the consequences of such an accident, it was calculated that the worker operating the core drill truck (onsite MEI) would receive an annual EDE of 0.29 rem and an organ dose equivalent annual occupational limit of 50 rem. Other personnel in the tank farm area would be expected to receive much smaller doses due to dispersion, evacuation, and the fact that not all of the release would be respirable. Here again, no adverse public health consequences are expected to result from this accident, because the expected doses to offsite individuals would be very small.

***Environmental Assessment: Thermocouple Tree System Installation and Operation in Non-Leaking Ferrocyanide Tanks*, DOE/EA-0809, U.S. Department of Energy, Richland, Washington (DOE 1992e)**

The EA considered a range of reasonably foreseeable accident scenarios associated with the proposed action that could result in a release of radioactive material or toxic gases. The accident scenarios and annualized probabilities of occurrence are summarized as (1) transitory gas release of 2.2×10^{-9}; (2) tree drop and tank penetration of less than 1.0×10^{-6}; and (3) organic carbon combustion of less than 1.0×10^{-6}.

In the transitory gas release scenario, a seismic event is postulated to occur during installation of the thermocouple trees (TCT), releasing significant quantities of flammable gas trapped in the sludge. The maximum reasonably foreseeable seismic event is assumed to cause a TCT to swing into a riser and cause a spark, initiating a vapor space fire. The estimated annualized probability of this accident occurring during installation of the TCTs is 2.2 x 10^{-9}. Weaker seismic events would not result in tank releases. The consequences of a transitory gas release and vapor space fire would be no greater than a ferrocyanide explosion (Section 5.2.7, Maximum Reasonably Foreseeable Accident).

In the TCT drop and tank penetration scenario, a TCT is postulated to drop during installation, punching a hole in the tank bottom. All drainable liquid in the tank is assumed to discharge to the soil column beneath the tank. The annualized probability that this would occur is estimated to be less than 1.0 x 10^{-6}. This probability is based on implementing the control features specified in the SA. The maximum reasonably foreseeable radioactive release would occur if Tank 241-C-112 were punctured, resulting in a potential release of 3,500 curies, which is contained in 1.2 x 10^{5} liters (32,000 gallons) of tank liquid. The EA concludes that the radioactive material would be retained within the first 30.5 meters (100 feet) of soil beneath the tank, and would remain at least 61 meters (200 feet) above the groundwater level. A leak in Tank 241-C-112 would not result in radiological exposures to onsite personnel or offsite individuals. Such a release would add to the volume of soil that would require future cleanup. Based on these consequences and the very low probability of occurrence, the risks associated with this potential accident are low.

The scenario involving organic carbon combustion is concerned with only one ferrocyanide tank, Tank 241-TX-118. This tank has a predominance of nitrate and nitrite saltcake, and relatively high organic carbon and plutonium contents. In this scenario, the TCT installation triggers a self-combustion of organic carbon and nitrate or nitrites. The EA notes that, assuming that the organic carbon constituents are evenly distributed, the calculated organic carbon concentration in Tank 241-TX 118 is below the concentration limit believed to be required for self-combustion. The EA estimates that the annual probability of occurrence of this accident scenario is less than 1.0 x 10^{-6}, and concludes that the consequences of organic carbon combustion would be similar to those projected in the *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes* (Section 5.2.7 for Maximum Reasonably Foreseeable Accident).

***Environmental Assessment: Tank 241-C-103 Organic Vapor and Liquids Characterization and Supporting Activities, Hanford Site, Richland, Washington*, DOE/EA-0881, U.S. Department of Energy, Richland, Washington (DOE 1993).**

The EA analyzed a range of reasonably foreseeable accidents, including a noxious or toxic gas release, a dip-sample bottle break outside the tank, radiation exposure from a gas sampling tube, a lightning strike that ignites organic vapors in the tank, and a vapor space fire and subsequent burn of the liquid organic layer in the tank. The accident with the highest probability of occurrence (approximately 1.0 x 10^{-5}) is the dip-sample bottle break, which would increase worker exposure to radiation, but would not be expected to result in any adverse health effects.

The noxious or toxic gas release (probability 1.0×10^{-6}) and radiation exposure from gas sampling (probability 2.5×10^{-6}) would not result in any adverse health effects to workers due to the use of protective clothing and supplied air in the vicinity of the sampling, and would have no impact on the public.

The remaining two accident scenarios involving ignition of flammable materials in the tank each have an estimated probability of 1.0×10^{-6} (Section 5.2.7, Maximum Reasonably Foreseeable Accident).

Finding of No Significant Impact
Waste Tank Safety Program at the Hanford Site

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-0915, to assess potential environmental impacts of a proposed action involving activities needed to resolve high-level radioactive waste tank safety issues at the Hanford Site. These activities would include the installation, operation, maintenance, and removal of in-tank and external monitoring devices and mitigation equipment; minor modifications to ventilation systems and other portions of the tank farm infrastructure; waste stabilization; sampling for waste characterization; and removal of organic waste from one high-level waste tank for storage in a non-high-level waste tank.

Based on the evaluation in the EA, the DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969 , 42 U.S.C. 4321, et seq. Therefore, the preparation of an environmental impact statement (EIS) is not required.

Addresses and Further Information:

Single copies of the EA and further information about the proposed project are available from:

Mr. R. E. Gerton, Director
Tank Waste Storage Division
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352
Phone: (509) 376-9106

For further information regarding the DOE NEPA process, contact:

Carol M. Borgstrom, Director
Office of NEPA Oversight (EH-25)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Phone: (202) 586-4600 or leave a message at (800) 472-2756

Background: DOE has conducted radioactive waste management operations at the Hanford Site for nearly 50 years. Operations have included storage of high-level radioactive waste in 177 underground storage tanks in both single-shell tanks and double-shell tanks. Many of the tanks and the equipment needed to operate them are deteriorated. Sixty-seven of the single-shell tanks are presumed to have leaked. Knowledge of the tank contents is incomplete and is based primarily on historical operating records and limited sampling information.

Safety issues associated with the waste include: (1) flammable gas generation and episodic release; (2) potentially explosive ferrocyanide-containing wastes; (3) a potentially flammable or explosive floating organic solvent layer in Tank 241-C-103; (4) nuclear criticality; (5) toxic vapors; (6) the need for infrastructure upgrades; and (7) the need to pump liquids from single-shell tanks that are assumed to be leaking (interim stabilization).

DDE needs to take action to accelerate resolution of waste tank safety issues at the Hanford Site to reduce the risks associated with operations and management of the waste tanks, to respond to Congressional concerns about the safety of Hanford tank operations as reflected in Public Law 101-510, to meet Resource Conservation and Recovery Act (RCRA) analytical data requirements, and to meet characterization commitments contained in the Hanford Federal Facility Agreement and Consent Order, more commonly known as the Tri-Party Agreement.

Proposed action: The proposed action would include general and specific waste tank characterization and mitigation activities, and minor facility modifications, at the Hanford Site. These activities would include the installation, operation, maintenance, and removal of in-tank and external monitoring devices and mitigation equipment (including thermocouples, multi-function instrument trees, liquid observation wells, various types of probes, surface level detectors, video cameras, infrared scanners, sludge weights, air lances, and various types of equipment designed to mitigate the buildup of flammable gases in waste tanks); sampling for waste characterization; minor modifications to ventilation systems and other portions of the tank farm infrastructure; interim stabilization of single-shell tanks suspected of leaking by pumping liquids to secure double-shell tanks; and removal of the layer of organic waste from Tank 241-C-103 to a tanker truck or a non-high-level waste tank for storage. Before the proposed activities are conducted, DOE would review or prepare appropriate safety and environmental documentation to ensure that the activities can be conducted safely and that potential risks were evaluated in the EA.

Alternatives considered: A no-action alternative was considered that would consist of continuing ongoing tank farm operations. Under that alternative

DOE would not gather the information needed to resolve waste tank safety issues at Hanford.

DOE also considered alternative strategies involving less intrusive techniques for resolution of tank safety issues. For example, DOE considered characterization using solely non-intrusive methods such as calculations based on historical process knowledge, and laboratory simulants. DOE also considered minimizing intrusive operations (e.g., monitoring without intrusive characterization activities). These alternative strategies were not considered viable, because new in-tank data are required to validate the theoretical projections that would be derived from the information produced by the non-intrusive alternatives. No other reasonable methods of addressing DOE's tank safety issues were identified.

Environmental impacts: Routine conduct of the proposed activities would not result in any increase in tank emissions. Before beginning the proposed activities, appropriate procedures and administrative controls would be in place to maintain radiation exposure to workers and other onsite personnel within requirements of DOE Orders and as low as reasonably achievable. Radiation and hazardous chemical levels at the sample riser and exposure of the workers would be monitored. Gas sampling of each tank's vapor space would be conducted, as appropriate, to assure that no flammable gases greater than 20 percent of the lower flammability limit (LFL) are present. Gas samples would be obtained from a riser test port, which is isolated from the environment by a high-efficiency particulate air filter. If flammable gas levels above 20 percent of the LFL are detected, the proposed activities would not be performed in the tank unless additional evaluations show that flammable gas concentrations are at safe levels. Additional safety controls (such as electrical grounding, spark resistant tools, vapor space purging, and the use of protective clothing and/or supplied air) also would be utilized when appropriate.

During routine conduct of the proposed activities, potential radiological doses to members of the public and workers performing the work would be extremely small, and are not expected to result in any health effects. The risks to workers from chemical exposures, burns and other common industrial hazards are expected to be low, and would be minimized by training and the use of appropriate personal protective equipment.

Small quantities of low-concentration hazardous wastes, such as solvents and cleaning agents, would be generated as a result of the proposed action. Such wastes would be managed at existing Hanford Site facilities in accordance with all applicable requirements.

Cumulative impacts: The proposed tank farm operations would not have a substantial cumulative effect on day-to-day operations on the Hanford Site with respect to worker exposure. The incremental impact of handling the increased amount of radioactive and non-radioactive materials would be very small. When added to the impacts from day-to-day operations on the Hanford Site and surrounding community, the total impact also would remain very small. The proposed activities are expected to slightly increase the potential risk of tank accidents in the short-term, but resolution of tank safety issues would minimize the potential for tank accidents in the long-term.

Impacts from potential accidents: The EA considered a range of reasonably foreseeable accident scenarios associated with the proposed action that could result in a release of radioactive material or toxic gases. These include a range of low probability, high consequence events and relatively higher probability, lower consequence events. Events with a relatively higher probability include a pumping system break (probability of 1.4 chances in 1,000 per year) or a hydrogen ignition during interim stabilization operations (probability of between 1 chance in 100 to 1 chance in 10,000 per year), a spill during removal of a sample (probability of 5 chances in 100,000 per year), and a release of toxic vapors (probability of 1 chance in 10,000 per year). None of these more probable events would be expected to have any adverse health impacts on either workers or members of the public.

More severe accidents such as ignition of flammable gas within a tank (probability of 1 chance in 10,000,000 per year) and the maximum reasonably foreseeable accident, detonation of Tank 241-SY-101 (probability of less than 1 chance in 1,000,000 per year) were also analyzed. The consequences of the maximum reasonably foreseeable accident would be no greater than those projected for a ferrocyanide tank explosion in the 1987 Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, (DOE/EIS-0013). The 1987 EIS projected that such an explosion would result in a short-term radiation dose of 200 millirems to the maximally exposed member of the public, and an offsite collective dose of 7,000 person-rem. Such an explosion would be expected to result in 4 offsite latent cancer fatalities, the contamination of a substantial area of land, and large doses to workers. A 1990 General Accounting Office study estimated that the consequences of the ferrocyanide tank explosion could be 10 to 100 times greater than those projected in the 1987 EIS. The GAO study did not reach a conclusion regarding the probability of a tank explosion. Even if the severe consequences of a ferrocyanide tank explosion projected by the GAO are assumed, in view of the extremely low probability of occurrence for the most severe accidents that the proposed action could cause, the risks posed to the environment and human health by this potential accident are small.

Determination: Based on the analysis in the EA, and after considering the preapproval review comments of the State of Washington, the Confederated Tribes of the Umatilla Indian Reservation, and the Yakama Indian Nation, I conclude that the proposed activities to address the DOE's safety initiatives do not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS for the proposed action is not required.

Issued at Washington, D.C., this 25th day of February, 1994.

for Tara O'Toole, M.D., M.P.H.
Assistant Secretary
Environment, Safety and Health

THIS PAGE INTENTIONALLY
LEFT BLANK