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CH2M HILL ENGINEERING CHANGE NOTICE

Page 1 of 3 ☒ DM ☐ FM ☐ TM

1a. ECN 722984 R 0

1b. Proj. ECN - - R

2. Simple Modification ☒ Yes ☐ No	3. Design Inputs – For full ECNs, record information on the ECN-1 Form (not required for Simple Modifications)		4. Date March 30, 2005
5. Originator's Name, Organization, MSIN, & Phone No. M.V. Shultz, Nuclear Safety & Licensing - Closure Operations, S7-90, 372-3740		6. USQ Number No. - - - R - ☒ N/A	7. Related ECNs 721465R6, 722803R0
8. Title Changes to Facility Worker Tech Basis Doc for 241-S-109 PWRS Authorization	9. Bldg. / Facility No. NA	10. Equipment / Component ID NA	11. Approval Designator NA
12. Engineering Documents/Drawings to be Changed (Incl. Sheet & Rev. Nos.) RPP-14286 Rev 1		13. Safety Designation ☐ SC ☐ SS ☐ GS ☒ N/A	14. Expedited/Off-Shift ECN? ☐ Yes ☒ No
15a. Work Package Number NA	15b. Modification Work Completed NA Responsible Engineer / Date	15c. Restored to Original Status (TM) NA Responsible Engineer / Date	16. Fabrication Support ECN? ☐ Yes ☒ No

17. Description of the Change (Use ECN Continuation pages as needed)

Revision two of RPP-14286 adds discussion of two new accident analyses (Vacuum Exhaust Line Rupture and Large Fires Involving Aboveground Tank/Vessel) and modifies the discussion of facility worker consequences related to criticality events (i.e., aboveground criticality consequence is "Significant"). Minor editorial changes are also part of this revision.

18. Justification of the Change (Use ECN Continuation pages as needed)

The changes are in support of the Demonstration Bulk Vitrification System (DBVS) operation. Th 241-S-109 Partial Waste Retrieval System (PWRS) provides the feed for the DBVS. Also, during review of the Facility Worker Technica Basis Document for the S-109 PWRS it was discovered that discussion of the Vacuum Exhaust Line Rupture accident had not been added as part of the Vacuum Retrieval Safety Basis amendment.

19. ECN Category

☒ Direct Revision
☐ Supplemental
☐ Void/Cancel

ECN Type

☐ Supercedure
☐ Revision

20. Distribution

Name	MSIN	Name	MSIN
J. M. Grigsby	S7-90	E. C. Heubach	S7-90
D. H. Irby	H6-60		
R. J. Stevens	R2-68		
M. V. Shultz	S7-90		
J. Shuen	H6-60		
R. C. Sorensen	H6-60		
CENTRAL FILES (Original plus 1)			

Release Stamp

DATE: MAR 31 2005
STA: 4
HANFORD RELEASE
ID: 2.

A-6003-563.1 (09/04)

CH2M HILL ENGINEERING CHANGE NOTICE	1a. ECN 722984 R 0
Page 2 of 3 ☒ DM ☐ FM ☐ TM	1b. Proj. ECN - - R

21. Revisions Planned (Include a brief description of the contents of each revision)
NA

Note: All revisions shall have the approvals of the affected organizations as identified in block 11 "Approval Designator," on page 1 of this ECN.

22. Design Basis Documents
☐ Yes ☒ No

23. Commercial Grade Item Dedication Numbers (associated with this design change)
NA

24. Engineering Data Transmittal Numbers (associated with this design change, e.g., new drawings, new documents)
NA

25. Other Non Engineering (not in HDCS) documents that need to be modified due to this change

Type of Document	Document Number	Update Completed On	Responsible Engineer (print/sign and date)
Alarm Response Procedure	None	—	—
Operations Procedure	None	—	—
Maintenance Procedure	None	—	—
Type of Document	Document Number	Type of Document	Document Number
See continuation sheet	—	—	—

26. Field Change Notice(s) Used?
☐ Yes ☒ No
If Yes, Record Information on the ECN-2 Form, attach form(s), include a descript on of the interim resolution on ECN Page 1, block 17, and identify permanent changes.

NOTE: ECNs are required to record and approve all FCNs issued. If the FCNs have not changed the original design media then they are just incorporated into the design media via an ECN. If the FCN did change the original design media then the ECN will include the necessary engineering changes to the original design media.

27. Design Verification Required?
☐ Yes ☒ No
If Yes, as a minimum attach the one page checklist from TFC-ENG-DESIGN-P-17.

28. Approvals

Facility/Project Signatures		Date	A/E Signatures		Date
Design Authority	NA	—	Originator/Design Agent	NA	—
Resp. Engineer	M.V. Shultz M.V. Shultz	3/30/2005	Professional Engineer	NA	—
Resp. Manager	J.M. Grigsby	3/30/05	Project Engineer	NA	—
Quality Assurance	NA	—	Quality Assurance	NA	—
IS&H Engineer	NA	—	Safety	NA	—
NS&L Engineer	M.V. Shultz M.V. Shultz	3/30/2005	Designer	NA	—
Environ. Engineer	NA	—	Environ. Engineer	NA	—
Engineering Checker	E.C. Heubach II	03/30/05	Other	NA	—
Other	NA	—	Other		—
Other			DEPARTMENT OF ENERGY / OFFICE OF RIVER PROTECTION		
Other			Signature or a Control Number that tracks the Approval Signature		
Other			NA		—
Other			ADDITIONAL SIGNATURES		
Other			NA		—
Other					

CH2M HILL ENGINEERING CHANGE NOTICE CONTINUATION SHEET	1a. ECN 722984 R 0
Page 3 of 3	1b. Proj. ECN - - R

Document/Drawing No. NA Sheet NA Revision NA

The safety basis amendment that this revision supports has been submitted for DOE approval. Once approval from DOE is received via a safety evaluation report, a safety basis revision will be released and any subsequent changes to company documents or procedures will be controlled via the process identified in TFC-ENG-SB-C-01, *Safety Basis Issuance and Maintenance*.

Note: An AutoCAD page may be used in place of this form (the header section items must be included on the AutoCAD page).

FACILITY WORKER TECHNICAL BASIS DOCUMENT

M. V. Shultz
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 722984 R0 UC: N/A
Cost Center: 7G250 Charge Code: 501907
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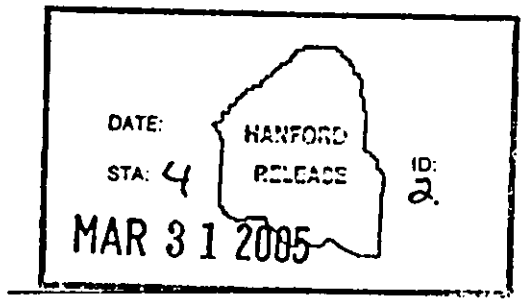
Key Words: Technical Safety Requirement, DSA, Administrative Control, TSR AC, Facility Worker, Onsite Worker, Candidate Accident, Representative Accident, Safety Management Programs

Abstract: This technical basis document was developed to support the Tank Farm Documented Safety Analysis (DSA). It describes the criteria and methodology for allocating controls to hazardous conditions with significant facility worker consequence and presents the results of the allocation.



3/31/05

Release Approval Date Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) **RECORD OF REVISION**	(1) Document Number RPP-14286	Page 1

(2) Title
Facility Worker Technical Basis Document

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Resp. Engr. (print/sign/date)	(6) Resp. Mgr. (print/sign/date)
0	EDT 632769		JM Grigsby
1	ECN 10 - Complete revision	MV Shultz	RJ Stevens
2 RS.	ECN 722984 20 Added discussion of two new accident analyses (Vacuum Exhaust Line Rupture and Large Fires Involving Aboveground Tank/Vessel) and modified the discussion of facility worker consequences related to criticality events (i.e., aboveground criticality consequence is "Significant"). Minor editorial changes are also part of this revision. This revision supports the DSA amendment for the S-109 PWRS waste feed to the DBVS.	MV Shultz M.V. Shultz 03/30/2005	JM Grigsby JM Grigsby 3/30/05

RPP-14286
Revision 2

Facility Worker Technical Basis Document

M. V. Shultz, Jr.
CH2M HILL Hanford Group, Inc.

Date Published
March 2005

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-99RL14047

CH2MHILL
Hanford Group, Inc.
P.O. Box 1500
Richland, Washington

Release Approval 3/31/05
Date

CONTENTS

APPENDIX

TABLE

LIST OF TERMS

Abbreviations and Acronyms

AC	administrative control
DCRT	double-contained receiver tank
DOE	U.S. Department of Energy
DSA	documented safety analysis (RPP-13033, *Tank Farms Documented Safety Analysis*)
DST	double-shell tank
FW	facility worker
ISMS	Integrated Safety Management System
LCO	limiting condition for operation
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
SMP	safety management program
SSC	structures, systems, and components
SST	single-shell tank
TSR	technical safety requirement

Terms

Candidate Accident. During DSA development "candidate" accident groups were defined based on common characteristics. These Candidate Accidents were evaluated to determine risk. All tank farms hazardous conditions involving releases of radioactive and other hazardous material are grouped according to these Candidate Accidents.

Representative Accident. Candidate Accidents found to represent significant risk (i.e., Risk Bin I or II) are designated "representative accidents." The representative accident numeric designation is based on the relevant representative accident section in Chapter 3.0 of RPP-13033, *Tank Farms Documented Safety Analysis*.

1.0 INTRODUCTION

1.1 PURPOSE

This technical basis document was developed to support RPP-13033, *Tank Farms Documented Safety Analysis* (DSA). It describes the criteria and methodology for allocating controls to hazardous conditions with significant facility worker (FW) consequence and presents the results of the allocation. The criteria and methodology for identifying controls that address FW safety are in accordance with DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*.

1.2 BACKGROUND INFORMATION

The U.S. Department of Energy (DOE), Office of River Protection (ORP) has provided guidance in internal letter "Replacement of Previous Guidance Provided by RL and ORP," (Klein and Schepens, 2003) regarding control of FW risk and their expectations for application of controls that affect the FW. It states in part: "For facility worker protection, significant hazardous events are evaluated for appropriate controls in accordance with DOE-STD-3009-94, Change Notice 2."

To meet the intent of this direction the following approach was adopted:

All hazardous conditions are evaluated for potentially significant FW risk. Hazardous conditions having significant FW consequence are subject to the formal control decision process. Two exceptions are made to this requirement:

- Hazardous conditions involving standard industrial hazards that are not initiators or contributors to an uncontrolled release of tank waste material are not evaluated. Standard industrial hazards are defined as those associated with commonly handled industrial chemicals and other occupational hazards controlled by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) standards (e.g., slips, trips, electrical). Contractually mandated safety management programs (SMP) address these issues.

- Hazardous conditions involving only direct exposure to ionizing radiation, except in the case of nuclear criticality, and control of radiological contamination are not evaluated. These hazards are specifically addressed by the radiological control program, required by Title 10, *Code of Federal Regulations*, Part 835, "Occupational Radiation Protection" (10 CFR 835).

Controls for FW risk are applied as follows:

- Hazardous conditions with safety-significant structures, systems, and components (SSC) and/or technical safety requirements (TSR) selected for the protection of the onsite worker are subjected to a three-step evaluation process:

  1. The hazardous conditions are evaluated to determine whether the onsite worker controls adequately address FW risk. No further control selection will be required if the controls are found to be adequate.

  2. If the evaluation of onsite worker controls finds that the controls do not adequately address FW risk, additional SMP controls are evaluated for applicability.

  3. If no SMP controls are identified as adequately addressing FW risk safety-significant SSCs and/or TSRs are developed to address FW risk.

- Where no safety-significant SSCs and/or TSRs are selected for protection of the onsite worker, hazardous conditions with potentially significant FW risk are subjected to a three-step evaluation process:

  1. The hazardous condition are evaluated for applicability of onsite worker controls selected from other hazardous conditions. If applicable controls are identified no further FW control decision is required.

  2. If no onsite worker controls are applicable, SMP controls are evaluated for FW risk. If applicable SMP controls at the TSR level are identified, no further FW control decision is required.

  3. Where SMP controls cannot be identified that adequately addressed risk to the FW, safety-significant SSCs and/or TSRs are developed to address FW risk.

Consideration of safety-significant SSCs and TSRs is based on engineering judgment of possible effects and the potential added value of safety-significant SSC designation (derived from DOE-STD-3009-94).

2.0 METHODOLOGY

2.1 FACILITY WORKER CONSEQUENCE ASSIGNMENT

The FW consequence assignment considers the aggregate effects (combination of radiological and toxicological exposures) that potentially result from an accident. The FW consequence is designated during the hazard evaluation process as either "Y" to indicate significant worker consequence or "N" to indicate no significant consequence. The designation is recorded in the

hazard evaluation database, documented in RPP-15188, *Hazard Evaluation Database Report.* FW consequence assigned during the hazard evaluation process, described in Chapter 3.0 of the DSA, is based on guidance provided in DOE-STD-3009-94. The standard defines significant FW consequence to be a prompt worker fatality or serious injuries to workers or significant radiological or chemical exposures.

2.2 FACILITY WORKER CONTROL IDENTIFICATION

The evaluation and control selection process begins by convening a group of subject matter experts, safety professionals, and supervisory personnel to consider the risk of a given event and identify the equipment and programs that may be available to reduce the consequences of that event for the public and onsite worker. Safety-significant SSCs and/or TSRs selected for the protection of the onsite worker are potential controls for protecting the FW.

For hazardous conditions that do not require assignment of safety-significant SSCs and/or TSRs for protection of the onsite worker, the primary mechanism for protecting the FW is SMPs. However, an SMP is elevated to TSR status when it is relied on to control hazardous conditions with significant FW consequence.

As part of the initial DSA development, FW controls were also identified for hazardous conditions where FW consequences were not estimated to be significant. This was done to verify adequate overall SMP applicability for FW safety.

The hierarchy of control decision preference is:

1. Preventive controls over mitigative.
2. Passive controls over active control.
3. Engineering controls over administrative controls.
4. Controls with the highest reliability.
5. Controls closest to the hazard.

Preventive controls, in all cases, protect the facility worker from the consequences of the accident because they prevent the occurrence of the event.

The cost of implementation and maintenance of available controls should be considered as a part of the control selection.

- For DSA development, a multi-step process, presented in Section 1.2 of this document, was applied to identify controls for hazardous conditions that have potential significant consequence for the FW.

3.0 RESULTS

The SMPs, in concert with the overall Integrated Safety Management System (ISMS) provide the foundation upon which FW safety is built. Some fundamental SMPs apply to all potential events affecting the FW and are implicit to the conduct of work at tank farms. These programs include work control, training and qualification, inspection, surveillance and maintenance, quality assurance, and emergency response. Safety-significant SSCs and TSRs identified for protection of the offsite individual and onsite worker often protect the FW. SMPs are specifically identified and elevated to a TSR level where they provide protection against significant consequence to the FW. The safety-significant SSCs and TSRs are recorded in the hazard evaluation database for each hazardous condition that is assigned controls. Table 1 presents a summary of the results of the evaluation of the controls for the protection of the facility worker.

TSRs include two administrative controls (AC) that are not specifically listed in the hazard evaluation database. These are:

1. The AC for source term controls. This control protects the source term assumptions in RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*, and RPP-8369, *Chemical Source Terms for Tank Farms Safety Analyses*, when used in the representative accident analyses.

2. The AC for tank farm instrumentation and measuring and test equipment program. This control applies to instrumentation used to verify compliance with TSR parameters.

For ease of reference, the results of this control evaluation are presented, in order, according to the following hierarchy:

- Representative accident designation
- Candidate accident designation
- FW exposure mechanism.

The section headings include, as applicable, the name of the representative accident, the representative accident number, the DSA representative accident evaluation section, and identification number of the hazard evaluation database candidate accident. In cases where no representative or candidate accident designation is applicable, the results are grouped by FW exposure mechanism. Chapter 3.0 of the DSA provides a discussion of the candidate and representative accident concept as applied to the development of representative accidents.

3.1 FLAMMABLE GAS ACCIDENTS – REPRESENTATIVE ACCIDENT 1 (DSA SECTION 3.3.2.4.1) (CANDIDATE ACCIDENTS 04/05)

The FW consequences associated with this accident scenario include radioactive and other toxic material inhalation. The postulated deflagration or detonation event is a high-energy release

event that develops rapidly. Response actions come too late to provide adequate mitigation. The consequences are estimated to be significant to the FW and significant to the onsite worker; therefore controls for the FW are required.

SSCs, limiting conditions for operation (LCO), and ACs for protection of the onsite worker are established to prevent the scenario. Preventive controls also protect the FW. The preventive SSCs are:

- Double-Shell Tank (DST) Primary Ventilation Systems
- Double Contained Receiver Tank (DCRT) Purge Air Systems
- Transfer Leak Detection Systems.

The preventive LCOs are:

- DST Primary Ventilation Systems
- Transfer Leak Detection Systems
- SST Passive Ventilation Systems.

The applicable ACs are:

- Flammable Gas Controls
- Transfer Controls
- Industrial Safety SMP
- Fire Protection SMP
- Environmental Management SMP.

The AC for flammable gas controls include: waste group controls, ventilation controls for DSTs; for single-shell tanks (SST); active catch tanks, inactive tanks, and DCRTs; waste-intruding equipment controls, vehicle controls, ignition source controls sets. Material balance requirements are included in the AC for transfer controls. These controls adequately protect the FW.

In addition to the above preventive controls the AC for emergency preparedness also protects the FW by ensuring that the appropriate mitigative steps are taken in the event of a flammable gas accident.

External fires that result in flammable gas deflagrations are also included in this representative accident and are addressed by the above listed controls.

3.2 NUCLEAR CRITICALITY – REPRESENTATIVE ACCIDENT 2 (DSA SECTION 3.3.2.4.2) (CANDIDATE ACCIDENT 01)

The FW consequences from exposure to fission product gases and aerosols resulting from a criticality accident are estimated to not be significant and have been determined to have low

consequence to the onsite worker. However, the consequences from exposure to nonradioactive tank waste materials from a criticality in an aboveground tank are identified as moderate for the onsite worker and potentially significant for the FW. In addition, the direct radiation exposure consequence to the FW was estimated to be significant. The most effective means of protecting the onsite worker and the FW is prevention of the accident; however, the unmitigated frequency of criticality is already established as "beyond extremely unlikely." The SMP, Nuclear Criticality Safety, ensures that work activities and planned equipment modification do not increase the likelihood of a criticality event.

3.3 RELEASE FROM CONTAMINATED FACILITY –REPRESENTATIVE ACCIDENT 4 (DSA SECTION 3.3.2.4.4) (CANDIDATE ACCIDENT 07)

Release of radioactive and other hazardous material contamination from a contaminated facility that has been part of the waste handling process may occur from a variety of causes. These are:

- Fires in or around contaminated facilities such as a pit, cell, catch tank, or sumps that provides a secondary confinement function for tank liquids
- Container ruptures or explosions at the 90-day storage pad
- Fires involving contaminated vehicles
- Flammable gas deflagrations in waste transfer-associated structures
- Flammable gas deflagrations in inactive storage facilities
- Disturbance of contamination by compressed gas action
- Dropped objects into contaminated areas.

These mechanisms create releases that can result in significant consequence to the FW and low consequence to the onsite worker except in the bounding case for flammable gas deflagrations in a waste transfer-associated structure where the onsite worker consequence is also significant.

Releases from contaminated facilities are addressed by the following TSR-level programs:

- Radiological Control SMP
- Waste Management SMP
- Hoisting and Rigging SMP.

No additional controls are required to protect the FW.

3.4 TANK FAILURE DUE TO EXCESSIVE LOADS – REPRESENTATIVE ACCIDENT 6 (DSA SECTION 3.3.2.4.6) (CANDIDATE ACCIDENTS 12/13)

This accident has been determined to have significant consequences to the onsite worker, however the risk binning for all but one case is III/IV. The one exception is the case of multiple tank failures from seismic events (Risk Bin II). The accident has potentially significant consequence to the FW in all cases. No preventive controls are required to address risk to the onsite worker although mitigative AC for emergency preparedness applies to seismic events as they related to tank failure due to excessive loads. The FW consequences resulting from damage to tank dome integrity are directly proportional to the extent of the damage. A complete collapse could result in a significant dose (worker falls into tank) ranging to less severe exposure if the dome is punctured and aerosols are released. Dome collapse was identified as a unique hazard that was not controlled by any existing SSC, TSR, or SMP.

To protect the FW, new TSR controls were developed. To prevent dome overload an AC for dome loading controls was developed to limit the loading allowed on tanks. A TSR-level SMP for hoisting and rigging controls was identified that prevents drops that may puncture tanks as a preventative measure.

3.5 ABOVEGROUND STRUCTURE FAILURE – REPRESENTATIVE ACCIDENT 10 (DSA SECTION 3.3.2.4.10) (CANDIDATE ACCIDENT 31)

This accident has been determined to have significant consequences to the onsite worker. FW consequences are also estimated to be significant. The bounding case is postulated to be a drop of waste containing equipment onto the soil surface. The toxicological component of the release drives the risk associated with this event. The control of this accident is based on limiting the quantity of material involved or controlling the dispersion energy available.

The following TSR-level controls were identified to protect the onsite worker.

- Radiological Control SMP
- Hoisting and Rigging SMP.

These controls are judged to adequately protect the FW.

3.6 MIXING OF INCOMPATIBLE MATERIALS – REPRESENTATIVE ACCIDENT 11 (DSA SECTION 3.3.2.4.11) (CANDIDATE ACCIDENTS 03/23)

This accident has been determined to have significant consequence to the onsite worker and the FW. Therefore, controls are required for the FW. The release of radioactive and other hazardous aerosols from tank vapor space to the atmosphere may be caused by chemical additions to a tank causing agitation and release of toxic vapors already present in the waste. Three specific ACs are identified for onsite worker protection:

- Bulk Chemical Addition Controls
- Industrial Hygiene SMP
- Training SMP.

The control for chemical addition is preventive and ensures only compatible materials are combined. The FW is protected by preventive controls. The SMPs protect the FW by ensuring safe work practices and management of regulated materials, including chemicals. These SMPs are elevated to a TSR-level control.

3.7 WASTE TRANSFER LEAK – REPRESENTATIVE ACCIDENT 13 (DSA SECTION 3.3.2.4.13) (CANDIDATE ACCIDENTS 33A THROUGH 33E)

The consequences for this accident are estimated to be significant for the onsite worker and the FW. The FW consequences associated with this accident scenario include physical injury by chemical exposure and radioactive material inhalation. Based on the onsite worker risk, TSR-level controls are required. These include the following SSCs:

- Transfer Leak Detection System
- Master Pump Shutdown Systems
- Service Water Pressure Detection Systems
- Backflow Preventers
- Isolation /Valves for Double Valve Isolation
- Hose-in-Hose Transfer Line Systems
- Aboveground Transfer System Vehicle Barriers.

The following LCOs were identified:

- Transfer Leak Detection System
- Backflow Prevention Systems.

The ACs applied are as follows:

- Emergency Preparedness
- Transfer Controls
- Administrative Locks.

These systems prevent the occurrence of a waste leak and/or the limit the size of a leak through mitigation. All of the controls that are established for protection of the onsite worker also protect the FW.

Additional TSR-level SMPs for were allocated to provide protection for the FW. These controls are:

- Radiological Control SMP
- Training SMP
- Excavation SMP.

3.8 UNPLANNED EXCAVATION/DRILLING – CANDIDATE ACCIDENT 28 (DSA SECTION 3.3.2.4.15) (CANDIDATE ACCIDENT 28)

The consequences of this event have been determined to be significant to the onsite worker and the FW. Although waste spills are isolated in soil and typically limited in volume, there are postulated accidents that can disperse significant quantities of contaminated soil. Dispersal of contaminates contained in 200 Area soils can occur by several mechanisms. Breaks in compressed air lines that pass through or over contaminated soil can disperse contamination. Unplanned digging in contaminated soils in cribs, ditches, ponds, and unplanned release sites can disperse contamination. Failures of vacuum excavation systems, as well as drilling techniques that use compressed air can disperse significant quantities of contamination.

The following TSR-level controls were identified to protect the onsite worker:

- Radiological Control SMP
- Environmental Management SMP
- Excavation SMP.

These controls are judged to adequately protect the FW.

3.9 EXTERNAL EVENTS – REPRESENTATIVE ACCIDENT 16 (DSA SECTION 3.3.2.4.16) (CANDIDATE ACCIDENT 35)

External events such as the aircraft crash, vehicle impact, offsite explosion, and power loss are considered to range in frequency from "unlikely" to "beyond extremely unlikely." FW consequences from this accident are estimated to be significant. The potential for serious injury or significant radiological exposure for the FW is addressed by applying the AC for emergency

preparedness. This control reduces the potential consequence by establishing an emergency response plan and evacuating the immediate area of a spill or fire. No additional controls to protect the FW are required.

3.10 VACUUM EXHAUST LINE RUPTURE – REPRESENTATIVE ACCIDENT 3 (DSA SECTION 3.3.2.4.3) (CANDIDATE ACCIDENT 36)

The consequences for this accident are estimated to be significant for the onsite worker and the FW. The FW consequences associated with this accident scenario include physical injury by chemical exposure and radioactive material inhalation. Based on the onsite worker risk, TSR-level controls are required. These include the following SSCs:

- HIHTL systems
- Aboveground transfer system vehicle barriers.

The ACs applied are as follows:

- Transfer Controls
- Vacuum Retrieval Controls
- Design Features.

These systems prevent the occurrence of a waste leak and/or the limit the size of a leak through mitigation. All of the controls that are established for protection of the onsite worker also protect the FW.

3.11 NATURAL EVENTS – REPRESENTATIVE ACCIDENT 17 (DSA SECTION 3.3.2.4.17) (VARIOUS CANDIDATE ACCIDENTS)

Earthquake, snow, wind, flooding, volcanic ash, lightning, and range fires are identified throughout the hazard evaluation database. Fires remain the most significant threat to tank farms. Lightning strikes are limited in the area, and controls are focused on eliminating flammable gases that would be ignited by the strike. Natural events are initiators for accidents already evaluated in the DSA. The potential for serious injury or significant radiological exposure for the FW is addressed by applying the AC for emergency preparedness. This control reduces the potential consequence by establishing an emergency response plan and evacuating the immediate area of a spill or fire. No additional controls to protect the FW are required.

3.12 CANDIDATE ACCIDENTS NOT SELECTED TO BE A REPRESENTATIVE ACCIDENT (RISK BIN III/IV)

The following candidate accidents were considered to be representative accidents during DSA development and were subjected to the same type of analysis as the other representative accidents. These accidents are not discussed in Section 3.3.2.4 of the DSA because they present limited risk (i.e., risk bin III of IV). Contractually mandated SMPs address FW safety for these accidents.

3.12.1 Filtration Failures Leading To Unfiltered Releases – Candidate Accidents 06/18b

This accident has been determined to have consequences that are not significant for the onsite worker. FW safety is addressed by contractually mandated SMPs.

3.12.2 Transportation Accidents – Candidate Accident 08

Control of packages and vehicles during transport on the Hanford Site is controlled by the requirements of DOE/RL-2001-0036, *Hanford Sitewide Transportation Safety Document*, and are not considered within the scope of the DSA.

However, there are hazards present during handling activities that prepare waste to be transported that are within the scope of the DSA. Transportation containers, including container vent systems, serve a safety function and are designed, constructed, and maintained according to the requirements of DOE/RL-2001-0036. Only one type of handling accident involving flammable gas deflagration in an onsite transfer cask has the potential for significant FW consequence. FW safety is addressed by contractually mandated SMPs.

3.12.3 Organic Solvent Fire – Candidate Accident 09a

The release of radioactive and toxic materials, combustion products, and tank waste aerosols from tanks to the atmosphere due to fire in a separable organic layer are estimated to be of significant consequence to the onsite worker and the FW. The only credible initiator for this type of event was determined to be a vehicle impact with tank structures that resulted in burning fuel flowing into the tank and igniting the organic solvent. However, based on the frequency this accident is risk bin III/IV. The risk is not sufficient to apply TSR-level controls for the onsite worker. FW safety is addressed by contractually mandated SMPs.

3.12.4 Tank Bump – Candidate Accident 18a

The consequences of a tank bump have been determined to have significant consequence for the onsite worker and the FW. However, based on the frequency, this accident is risk bin III/IV.

The risk is not sufficient to apply TSR-level controls for the onsite worker. FW safety is addressed by contractually mandated SMPs.

3.12.5 Evaporator Dump – Candidate Accident 22

This accident has been determined to have consequences that are not significant for the onsite worker. In addition, FW consequences associated with the evaporator dump scenarios are not estimated to be significant. FW safety is addressed by contractually mandated SMPs.

3.12.6 Steam Intrusion From Interfacing Systems – Candidate Accident 32

This accident has been determined to have consequences that are not significant for the onsite worker. In addition, FW consequences associated with the steam intrusion scenarios are not estimated to be significant. FW safety is addressed by contractually mandated SMPs.

3.12.7 Aboveground Tank Failure – Candidate Accident 34

This accident has been determined to have consequences that are not significant for the onsite worker. The FW consequences of the aboveground tank failure are estimated to be significant. FW safety is addressed by contractually mandated SMPs.

3.12.8 Large Fires Involving Tank/Vessel – Candidate Accident 37

This accident has been determined to have consequences that are not significant for the onsite worker. The FW consequences of a large fire involving tank/vessel are estimated to be significant. FW safety is addressed by contractually mandated SMPs.

3.13 HAZARDOUS CONDITIONS NOT ASSIGNED TO A REPRESENTATIVE OR CANDIDATE ACCIDENT

Many hazardous conditions present in the hazard evaluation database are not specifically assigned to a representative or candidate accident. These fall into two general categories. The first category is hazardous conditions with characteristics similar to a particular representative accident. These hazardous conditions were evaluated as part of the appropriate representative accident. The second category is hazardous conditions that do not have characteristics similar to a particular representative accident.

Many of the hazardous conditions in the second category that result in significant FW consequences do not involve exposure to radioactive or toxic material. The hazardous condition

occurs as the result of slips, trips, falls, electrical hazards, or involve exposure to toxic materials not associated with tank waste (e.g., chemicals used to control waste chemistry), or involve only direct exposure to ionizing radiation with no release of contamination. In these cases, contractually mandated programs (OSHA, industrial hygiene, or radiological control) address FW safety. These hazardous conditions are not evaluated further for additional controls.

3.13.1 Facility Worker Exposure from Direct Contact with Radioactive Contamination or Inhalation

Hazardous conditions grouped in this category are characterized by:

- FW falls into waste containing pit (barrier failure, earthquake, high wind) resulting in potential significant FW consequence
- FW contaminated during decontamination, cleanup, or demobilization activities resulting in FW consequence that is not significant
- Release of contamination from flex receiver activities (leaking bag, ripped bag, improper sealing)
- Contact with or spread of contamination during tank sampling activities (spills, dropped samples, contact with contaminated surfaces).

The frequency of the above hazardous conditions span a wide range from "anticipated" to "extremely unlikely." The FW consequences for a limited number of the above hazardous conditions may be significant. However, hazardous conditions resulting in significant FW consequences are associated with standard industrial hazards. In these cases, contractually mandated programs (OSHA, industrial hygiene, or radiological control) address FW safety. These hazardous conditions are not evaluated further for additional controls.

FW consequence from exposures to radioactive and other hazardous materials as a result of the above hazardous conditions is not significant. No additional controls are required to protect the FW.

3.13.2 Overflows of Catch Tank in the 204-AR Vault Resulting in Facility Worker Exposure to Radioactive and Other Hazardous Materials

Hazardous conditions grouped in this category are characterized by overfill of catch tank due to chemical failures.

No significant FW consequences are identified. FW safety is addressed by contractually mandated SMPs.

3.13.3 Releases of, or Exposure to, Radioactive Material from Clean-Out Boxes, Pits and Risers

Hazardous conditions grouped in this category are characterized by:

- Releases of contamination during pit access or pit cover removal
- Releases of contamination during riser access activities (equipment removal and installation)
- Releases of contamination due to riser damage during crane operations
- Releases of contamination from vertical storage units
- Spread of contamination from clean-out boxes, pits resulting from seismic, high wind.

No significant FW consequences are identified. FW safety is addressed by contractually mandated SMPs.

3.13.4 Release of Radioactive and Other Hazardous Materials Due to Flame Arc Cutting, Plasma Cutting, or Welding of Contaminated Structural Components

The hazardous conditions in this group are specific to the activities of flame arc cutting, plasma cutting, or welding of contaminated equipment and structures. This activity involves minor dispersal of contamination but has a high-energy release characteristic resulting in the potential to vaporize hazardous materials. The consequence to the FW is considered to be not significant based on the amount of material at risk. FW safety is addressed by contractually mandated SMPs.

3.13.5 Release of Radioactive Material from Contaminated Aboveground Structures

The hazardous conditions in this group are characterized by:

- Vent stack collapse at 242-T Evaporator resulting from aging and seismic activity
- Migration of contamination into 242-T Evaporator control room resulting from monitoring failures
- Building collapse due to aging, wind, seismic activity associated with the 242-T Evaporator and Cesium Loadout (C-801) facilities
- Water intrusion events in aboveground structures that result in transport of contamination outside of the facility
- Wind creating missile damage to vulnerable contaminated facilities resulting in release of contamination (ITS-1 in-tank solidification facility).

The hazardous conditions in this group are specific to structural failure or movement of contamination out of these facilities. Safety concerns for the FW in regard to injury directly attributable to structural collapse are addressed under contractually mandated SMPs. However, the consequence to the FW is considered to be not significant based on the amount of material at risk. FW safety is addressed by contractually mandated SMPs.

3.13.6 Disturbance of Contamination Due to Liquefied Petroleum Gas Explosion

The hazardous conditions in this group are specific to events involving a large propane storage tank located near the 242-S Evaporator building. Safety concerns for the FW in regard to injury from blast or fire effects are addressed under contractually mandated SMPs. The consequence to the FW is considered to be not significant based on exposure to the small amount of radioactive contamination that may be present. FW safety is addressed by contractually mandated SMPs.

4.0 CONCLUSIONS

All hazardous conditions were evaluated for FW consequences. Hazardous conditions with significant FW consequence were further evaluated to identify controls and verify that their application prevented serious injury, or significant radiological and chemical exposure.

Safety-significant SSCs and/or TSRs were identified in all cases where the FW had significant potential consequences as a result of exposure to radioactive and other toxic materials. The controls selected to protect the offsite individual and onsite worker in many cases provided adequate protection for the FW.

In cases where FW consequence was significant and the onsite worker consequence was low, safety-significant SSCs and TSR controls were applied from other hazardous conditions or were identified specifically to protect the FW. All hazardous conditions with significant FW consequence had an appropriate control or controls applied. The results of the FW control allocations are recorded in the hazard evaluation database along with a FW control memo detailing an assessment of the control allocation.

As part of the initial DSA development, controls were also identified for hazardous conditions that had no significant FW consequences. This was done in order to establish additional assurance that FW risk was adequately addressed. The existing contractually mandated SMPs for protection of the FW were found to adequately protect the FW from these lower risk hazardous conditions.

The following LCOs and ACs that were identified for onsite worker protection also provide protection to the FW for the hazards currently associated with tank farm operation:

- LCO 3.1.1, Transfer Leak Detection Systems
- LCO 3.1.2, Backflow Prevention Systems
- LCO 3.2.1, DST Primary Ventilation Systems
- LCO 3.2.2, SST Passive Ventilation Systems

- AC: 5.7, Safety Management Programs
  - Environmental management
  - Excavation
  - Fire protection
  - Hoisting and rigging
  - Industrial hygiene
  - Industrial safety
  - Nuclear criticality
  - Radiological control
  - Training
  - Waste management
- AC: 5.8, Emergency Preparedness
- AC 5.10, Flammable Gas Controls
- AC 5.11, Transfer Controls
- AC 5.12, Administrative Lock Controls
- AC 5.13, Bulk Chemical Addition Controls.

The following AC was developed specifically for protection of the FW:

- AC: 5.14, Dome Loading.

The following SMPs are important components of the ISMS and should not be considered less important in protecting the FW if they were not identified above. The SMPs support the concepts addressed in the tank farm ISMS, by adding layers of protection, both directly and indirectly. Therefore, the commitment to SMPs serves as the cornerstone of the selected controls and supports ISMS. The complete list of SMPs consists of the following:

- Procedures and training
- Environmental management
- Radiological control
- Waste management
- Nuclear criticality
- Industrial safety
- Industrial hygiene
- Fire protection program
- Emergency preparedness
- Conduct of operations
- Quality assurance
- Waste transfer compatibility
- Hoisting and rigging program
- Measuring and test equipment program
- Interfacing facilities program
- Excavation program.

The comprehensive control set, including safety-significant SSCs and non-SMP TSRs chosen to protect the onsite worker and the FW is presented in Table 1.

5.0 REFERENCES

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

DOE/RL-2001-0036, 2002, *Hanford Sitewide Transportation Safety Document (TSD)*, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-STD-3009-94, 2002, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, Change Notice No. 2, U.S. Department of Energy, Washington, D.C.

Klein, K. A, and R. J. Schepens, 2003, "Replacement of Previous Guidance Provided by RL and ORP," (letter 03-ABD-0047/0300642 to E. K. Thomson, Fluor Hanford, Inc., and E. S. Aromi, CH2M HILL Hanford Group, Inc., February 4), U.S. Department of Energy, Richland Operations Office, and Office of River Protection, Richland, Washington.

RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*, as amended, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-8369, *Chemical Source Terms for Tank Farms Safety Analyses*, as amended, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-13033, *Tank Farms Documented Safety Analysis*, as amended, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-15188, *Hazard Evaluation Database Report*, as amended, CH2M HILL Hanford Group, Inc., Richland, Washington

Table 1. Tank Farm Documented Safety Analysis Control Selection. (2 sheets)

Candidate Accident	Accident description	Onsite Worker Risk Bin (radiological and toxicological)	Significant FW Consequence	Safety Significant SSCs and TSRs																											Safety Management Programs														
				SSC: DST Primary Ventilation Systems	SSC: DCRT Purge Air Systems	SSC: Transfer Leak Detection Systems	SSC: Master Pump Shutdown Systems	SSC: Service Water Pressure Detection Systems	SSC: Backflow Preventers	SSC: Isolation Valves for Double Valve Isolation (DVI)	SSC: Hose-in-Hose Transfer Line Systems	SSC: Aboveground Transfer System Vehicle Barriers	LCO: DST Primary Ventilation Systems	LCO: Transfer Leak Detection Systems	LCO: SST Passive Ventilation System	LCO: Backflow Prevention Systems	AC: Emergency Preparedness	AC: Flammable Gas Controls - Waste Group Controls	AC: Flammable Gas Controls - DSTs	AC: Flammable Gas Controls - SSTs	AC: Flammable Gas Controls - DCRTs	AC: Flammable Gas Controls - Active Catch Tanks	AC: Flammable Gas Controls: Inactive Tanks	AC: Flammable Gas Controls - Waste-Intruding Equipment	AC: Transfer Controls - Transfer System Configuration Management	AC: Bulk Chemical Addition Controls	AC: Dome Loading Controls	AC: Ignition Source Controls Sets	AC: Flammable Gas Controls - Vehicle Controls	AC: Administrative Lock Controls	AC: Vacuum Retrieval Controls	Nuclear Criticality Safety (FW only)	Industrial Hygiene (FW only)	Industrial Safety	Radiological Control	Waste Management	Fire Protection	Environmental Management	Measuring and Test Equipment	Training	Excavation	Hoisting and Rigging
01	Nuclear Criticality	IV/IV	Y																											X													
03/23	Mixing of Incompatible Materials	III/II	Y																							X					X							X				
04/05	Flammable Gas Accidents	III/II	Y	X	X	X						X	X	X		X	X	X	X	X	X	X	X	X	X			X				X		X	X						
06/18B	Filtration Failures Leading to Unfiltered Releases	III/III	N																																						
07	Release from Contaminated Facility	III/I	Y																												X			X						X
08	Transportation Accidents	III/III	Y																																						
09A	Organic Solvent Fire	III/III	Y																																						
12/13	Tank Failure Due to Excessive Loads (not seismic)	IV/III	Y																							X															X
12/13	Tank Failure Due to Excessive Loads (seismic)	III/II	Y														X																								
18A	Tank Bump	III/IV	Y																																						
22	Evaporator Dump	III/III	N																																						
28	Unplanned Excavation/Drilling	I/III	Y																												X						X		X	
31	Aboveground Structure Failure	III/III	Y																												X									X
32	Steam Intrusion from Interfacing Systems	III/III	N																																						
33	Waste Transfer Leak	I/I	Y			X	X	X	X	X	X	X		X		X	X										X	X	X		X						X	X		
34	Aboveground Tank Failure	III/III	Y																												X	X					X			
35	External Events	IV/III	Y														X																								
36	Vacuum Exhaust Line Rupture	III/I	Y							X	X																X	X		X							X			
37	Large Fires Involving Tank/Vessel	III/III	Y																																		X		X		
N/A	Natural Events (initiators)	N/A	N/A														X																								
N/A	Release Events Not Assigned to Representative Accident	III/III	N																																						

Table 1. Tank Farm Documented Safety Analysis Control Selection. (2 sheets)

Notes:

AC = administrative control.
DCRT = double-contained receiver tank.
DST = double-shell tank.
DVI = double valve isolation.
FW = facility worker.
LCO = limiting conditions for operation.
N = no significant consequences.
N/A = not applicable.
SST = single-shell tank.
SSC = structures, systems and components.
TSR = technical safety requirement.
Y = significant work consequences.

APPENDIX A

PEER REVIEW AND HUMAN FACTORS EVALUATION CHECKLISTS

APPENDIX A

PEER REVIEW AND HUMAN FACTORS EVALUATION CHECKLISTS

Human Factors Evaluation Checklist.

Hazard Analysis Title: Worker Safety

Documented Safety Analysis Section Number: 3.3.2.3.3

Item No.	Issue	Yes, No, Unknown
1	Does the activity/event being planned/analyzed require human interaction to successfully complete the activity or mitigate consequences of the event? If the answer is No, STOP. Otherwise continue with Item No. 2.	No
2	Are procedures/instructions available to the individuals responsible for the action?	
3	Are procedures/instructions complete, accurate, and validated?	
4	Are the individuals responsible for the action also responsible for collateral duties?	
5	Are staffing levels adequate to perform the activity?	
6	Are the individuals responsible for the action adequately trained, qualified, and experienced to perform the actions?	
7	Have the required actions been walked down in the field to verify execution within the time constraints identified in the hazard analysis?	
8	Have physical obstacles that could prevent successful completion of the activity been removed or accounted for?	
9	Have work area environmental concerns been identified and accounted for?	
10	Has PPE been dedicated and is available, if required?	
11	Have the appropriate tools been dedicated and are available, if required?	
12	Does workstation configuration facilitate completion of the actions?	
13	Are instruments, valves, switches, or other devices accessible?	
14	Are instruments, valves, switches, or other devices properly tagged or labeled?	
15	Is communication equipment operable, dedicated, and available, if necessary?	
16	Is adequate fixed lighting in place?	
17	Is portable lighting dedicated, functional, and available, if necessary?	
18	Are confined space restrictions adequately addressed?	
19	Is temperature, humidity, radiological, and toxicological conditions acceptable for human occupancy?	
20	Is hazard material or radiological monitoring equipment dedicated, functional, and available, if needed?	
21	Are access controls identified and keys available?	
22	Can activities be completed within the time prescribed in the hazard analysis?	

If any answer for Items 2 through 22 is No or Unknown, corrective actions may be required to ensure successful completion of the activity as described in the hazard analysis. Document required corrective actions using the TFC PER process

23	Evaluator:		
	MILTON V SHULTZ (Printed)	Milton V. Shultz (Signature)	3/29/2005 (Date)
	Peer Reviewer:		
	E C HEUBACH III (Printed)	E C Heubach III (Signature)	03/29/05 (Date)

NS&L CHECKLIST FOR TECHNICAL PEER REVIEW

Document Reviewed: RPP-14286, *Facility Worker Technical Basis Document*, Rev. 2

Scope of Review (e.g., document section or portion of calculation): Complete document as revised for release as Revision 2.

Yes	No*	NA		
☐	☐	☒	1.	Previous reviews are complete and cover the analysis, up to the scope of this review, with no gaps. **Explanation: Peer review for Rev. 2 not dependent on previous reviews.*
☒	☐	☐	2.	Problem is completely defined. **Explanation:*
☒	☐	☐	3.	Accident scenarios are developed in a clear and logical manner. **Explanation:*
☒	☐	☐	4.	Analytical and technical approaches and results are reasonable and appropriate. *(ORP QAPP criterion 2.8)* **Explanation:*
☒	☐	☐	5.	Necessary assumptions are reasonable, explicitly stated, and supported. *(ORP QAPP criterion 2.2)* **Explanation:*
☐	☐	☒	6.	Computer codes and data files are documented. **Explanation:*
☐	☐	☒	7.	Data used in calculations are explicitly stated. **Explanation:*
☒	☐	☐	8.	Bases for calculations, including assumptions and data, are consistent with the supported safety basis document (e.g., the Tank Farms Documented Safety Analysis). **Explanation:*
☒	☐	☐	9.	Data were checked for consistency with original source information as applicable. *(ORP QAPP criterion 2.9)* **Explanation:*
☒	☐	☐	10.	For both qualitative and quantitative data, uncertainties are recognized and discussed, as appropriate. *(ORP QAPP criterion 2.17)* **Explanation:*
☐	☐	☒	11.	Mathematical derivations were checked including dimensional consistency of results. *(ORP QAPP criterion 2.16)* **Explanation:*
☐	☐	☒	12.	Models are appropriate and were used within their established range of validity or adequate justification was provided for use outside their established range of validity. **Explanation:*
☐	☐	☒	13.	Spreadsheet results and all hand calculations were verified. **Explanation:*
☐	☐	☒	14.	Calculations are sufficiently detailed such that a technically qualified person can understand the analysis without requiring outside information. *(ORP QAPP criterion 2.5)* **Explanation:*
☐	☐	☒	15.	Software input is correct and consistent with the document reviewed. **Explanation:*
☐	☐	☒	16.	Software output is consistent with the input and with the results reported in the document reviewed. **Explanation:*
☐	☐	☒	17.	Software verification and validation are addressed adequately. *(ORP QAPP criterion 2.6)* **Explanation:*
☒	☐	☐	18.	Limits/criteria/guidelines applied to the analysis results are appropriate and referenced. Limits/criteria/guidelines were checked against references. *(ORP QAPP criterion 2.9)* **Explanation:*
☐	☐	☒	19.	Safety margins are consistent with good engineering practices. **Explanation:*
☒	☐	☐	20.	Conclusions are consistent with analytical results and applicable limits. **Explanation:*
☒	☐	☐	21.	Results and conclusions address all points in the purpose. *(ORP QAPP criterion 2.3)* **Explanation:*
☒	☐	☐	22.	All references cited in the text, figures, and tables are contained in the reference list. **Explanation:*
☒	☐	☐	23.	Reference citations (e.g., title and number) are consistent between the text callout and the reference list. **Explanation:*

ECHc 03/30/05
Initials Date

Form Current To 12/08/2004

NS&L CHECKLIST FOR TECHNICAL PEER REVIEW

Yes	No*	NA	
☒	☐	☐	24. Only released (i.e., not draft) references are cited. *(ORP QAPP criterion 2.1)* *Explanation:
☒	☐	☐	25. Referenced documents are retrievable or otherwise available. *Explanation:
☒	☐	☐	26. The most recent version of each reference is cited, as appropriate. *(ORP QAPP criterion 2.1)* *Explanation:
☒	☐	☐	27. There are no duplicate citations in the reference list. *Explanation:
☒	☐	☐	28. Referenced documents are spelled out (title and number) the first time they are cited. *Explanation:
☒	☐	☐	29. All acronyms are spelled out the first time they are used. *Explanation:
☒	☐	☐	30. The Table of Contents is correct. *Explanation:
☒	☐	☐	31. All figure, table, and section callouts are correct. *Explanation:
☐	☐	☒	32. Unit conversions are correct and consistent. *Explanation:
☐	☐	☒	33. The number of significant digits is appropriate and consistent. *Explanation:
☐	☐	☒	34. Chemical reactions are correct and balanced. *Explanation:
☒	☐	☐	35. All tables are formatted consistently and are free of blank cells. *Explanation:
☒	☐	☐	36. The document is complete (pages, attachments, and appendices) and in the proper order. *Explanation:
☒	☐	☐	37. The document is free of typographical errors. *Only the section(s) being reviewed was checked for typographical errors.* *Explanation:
☒	☐	☐	38. The tables are internally consistent. *Explanation:
☒	☐	☐	39. The document was prepared in accordance with HNF-2353, Section 4.3, Attachment B, "Calculation Note Format and Preparation Instructions." *Explanation:
☒	☐	☐	40. Impacted documents are appropriately identified in Blocks 7 and 25 of the Engineering Change Notice (form A-6003-563.1). *Explanation:
☒	☐	☐	41. If more than one Technical Peer Reviewer was designated for this document, an overall review of the entire document was performed after resolution of all Technical Peer Review comments and confirmed that the document is self-consistent and complete. *Explanation:
☒	☐	☐	**Concurrence** *(Concurrence qualified by response to item #24 above.)*

E. C. Heubach II E C Heubach 03/30/05

Reviewer (Printed Name and Signature) Date

* If No is chosen, an explanation must be provided on this form.

Additional explanation:

CHECKLIST FOR TECHNICAL PEER REVIEW

Documen: Reviewed: RPP-14286, *Facility Worker Technical Basis Document*, Rev. 2

Scope of Review (e.g., document section or portion of calculation): Technical edit

Yes	No	NA*	
[ ]	[ ]	[x]	1. Previous reviews are complete and cover the analysis, up to the scope of this review, with no gaps.
[ ]	[ ]	[x]	2. Problem is completely defined.
[ ]	[ ]	[x]	3. Accident scenarios are developed in a clear and logical manner.
[ ]	[ ]	[x]	4. Analytical and technical approaches and results are reasonable and appropriate. *(ORP QAPP criterion 2.8)*
[ ]	[ ]	[x]	5. Necessary assumptions are reasonable, explicitly stated, and supported. *(ORP QAPP criterion 2.2)*
[ ]	[ ]	[x]	6. Computer codes and data files are documented.
[ ]	[ ]	[x]	7. Data used in calculations are explicitly stated.
[ ]	[ ]	[x]	8. Bases for calculations, including assumptions and data, are consistent with the supported safety basis document (e.g., the Tank Farms Final Safety Analysis Report).
[ ]	[ ]	[x]	9. Data were checked for consistency with original source information as applicable. *(ORP QAPP criterion 2.9)*
[ ]	[ ]	[x]	10. For both qualitative and quantitative data, uncertainties are recognized and discussed, as appropriate. *(ORP QAPP criterion 2.17)*
[ ]	[ ]	[x]	11. Mathematical derivations were checked including dimensional consistency of results. *(ORP QAPP criterion 2.16)*
[ ]	[ ]	[x]	12. Models are appropriate and were used within their established range of validity or adequate justification was provided for use outside their established range of validity.
[ ]	[ ]	[x]	13. Spreadsheet results and all hand calculations were verified.
[ ]	[ ]	[x]	14. Calculations are sufficiently detailed such that a technically qualified person can understand the analysis without requiring outside information. *(ORP QAPP criterion 2.5)*
[ ]	[ ]	[x]	15. Software input is correct and consistent with the document reviewed.
[ ]	[ ]	[x]	16. Software output is consistent with the input and with the results reported in the document reviewed.
[ ]	[ ]	[x]	17. Software verification and validation are addressed adequately. *(ORP QAPP criterion 2.6)*
[ ]	[ ]	[x]	18. Limits/criteria/guidelines applied to the analysis results are appropriate and referenced. Limits/criteria/guidelines were checked against references. *(ORP QAPP criterion 2.9)*
[ ]	[ ]	[x]	19. Safety margins are consistent with good engineering practices.
[ ]	[ ]	[x]	20. Conclusions are consistent with analytical results and applicable limits.

03/17/05

CHECKLIST FOR TECHNICAL PEER REVIEW

[ ]	[ ]	[x]	21. Results and conclusions address all points in the purpose. *(ORP QAPP criterion 2.3)*
[x]	[ ]	[ ]	22. All references cited in the text, figures, and tables are contained in the reference list.
[x]	[ ]	[ ]	23. Reference citations (e.g., title and number) are consistent between the text callout and the reference list.
[x]	[ ]	[ ]	24. Only released (i.e., not draft) references are cited. *(ORP QAPP criterion 2.1)*
[x]	[ ]	[ ]	25. Referenced documents are retrievable or otherwise available.
[x]	[ ]	[ ]	26. The most recent version of each reference is cited, as appropriate. *(ORP QAPP criterion 2.1)*
[x]	[ ]	[ ]	27. There are no duplicate citations in the reference list.
[x]	[ ]	[ ]	28. Referenced documents are spelled out (title and number) the first time they are cited.
[x]	[ ]	[ ]	29. All acronyms are spelled out the first time they are used.
[x]	[ ]	[ ]	30. The Table of Contents is correct.
[x]	[ ]	[ ]	31. All figure, table, and section callouts are correct.
[x]	[ ]	[ ]	32. Unit conversions are correct and consistent.
[x]	[ ]	[ ]	33. The number of significant digits is appropriate and consistent.
[ ]	[ ]	[x]	34. Chemical reactions are correct and balanced.
[x]	[ ]	[ ]	35. All tables are formatted consistently and are free of blank cells.
[x]	[ ]	[ ]	36. The document is complete (pages, attachments, and appendices) and in the proper order.
[x]	[ ]	[ ]	37. The document is free of typographical errors.
[x]	[ ]	[ ]	38. The tables are internally consistent.
[x]	[ ]	[ ]	39. The document was prepared in accordance with HNF-2353, Section 4.3, Attachment B, "Calculation Note Format and Preparation Instructions".
[ ]	[ ]	[x]	40. Impacted documents are appropriately identified in Blocks 7 and 25 of the Engineering Change Notice (form A-6003-563.1).
[ ]	[ ]	[x]	41. If more than one Technical Peer Reviewer was designated for this document, an overall review of the entire document was performed after resolution of all Technical Peer Review comments and confirmed that the document is self-consistent and complete.
[x]	[ ]	[ ]	**Concurrence**

Leona Aamot — 03/17/05

Reviewer (Printed Name and Signature) — Date

- If No or NA is chosen, provide an explanation on this form.

Technical Edit

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