

Station 15

MAR 10 2000
100-100521

21

ENGINEERING DATA TRANSMITTAL

HmLM0581

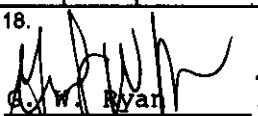
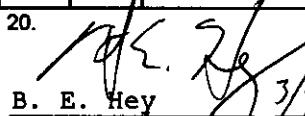
116375/BB20

5

1. EBT

Page 7 of 7

622347

2. To: (Receiving Organization) TWRS Nuclear Safety & Licensing		3. From: (Originating Organization) FDNW Safety Analysis & Nuc. Engr.		4. Related EDT No.: N/A							
5. Proj./Prog./Dept./Div.: TWRS		6. Design Authority/Design Agent/Cog. Engr.: G. W. Ryan		7. Purchase Order No.: N/A							
8. Originator Remarks: The attached document contains the hazard analysis that has been performed to address Waste Feed Delivery operations and activities.											
11. Receiver Remarks:		11A. Design Baseline Document? <input type="radio"/> Yes <input checked="" type="radio"/> No		None.							
15. DATA TRANSMITTED											
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F)	(G)	(H)	(I)			
1	RPP-5914	N/A	0	Hazard Evaluation for Waste Feed Delivery Operations and Activities	N/A	1	1	1			
16. KEY											
Approval Designator (F)	Reason for Transmittal (G)			Disposition (H) & (I)							
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)		1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged						
17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority				1	1	Peer Review	M. V. Shultz	3/9/00	B4-47
		Design Agent									
1	1	Cog. Eng. G. W. Ryan	<i>G. W. Ryan</i>	3/9/00	B4-47						
1	1	Cog. Mgr. B. E. Hey	<i>B. E. Hey</i>	3/9/00	B4-47						
		QA									
		Safety									
		Env.									
18.  G. W. Ryan Signature of EDT Originator		19.  T. G. Goetz Authorized Representative for Receiving Organization		20.  B. E. Hey Design Authority/ Cognizant Manager		21. DOE APPROVAL (if required)					
						Ctrl No. _____ <input type="radio"/> Approved <input type="radio"/> Approved w/comments <input type="radio"/> Disapproved w/comments					

Hazard Evaluation for Waste Feed Delivery Operations and Activities

G. W. Ryan

Fluor Federal Services
Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-99RL14047

EDT/ECN: 622347
Cost Center: 403
B&R Code: N/A

UC: 510
Charge Code: 110375 /BB20
Total Pages: 294

Key Words: WFD, Phase I, hazard analysis, PHA, HazOp, Project W-211

Abstract: This document contains the results of the hazard analysis that has been performed to address Waste Feed Delivery operations and activities.

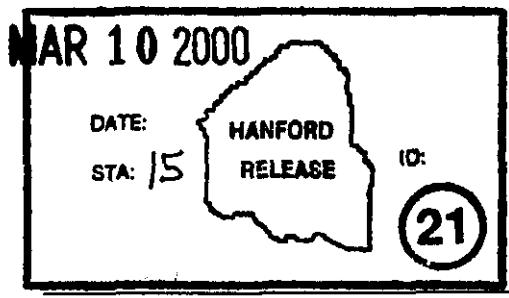
TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Karen H. Noland

3/10/2000

Date



Release Stamp

Approved For Public Release

RPP-5914
Revision 0

Hazard Evaluation for Waste Feed Delivery Operations and Activities

G. W. Ryan
Fluor Federal Services

Date Published
March 2000

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

CH2MHILL
Hanford Group, Inc.

Richland, Washington

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC06-99RL14047

Approved for Public Release; Further Dissemination Unlimited

**Hazard Evaluation for
Waste Feed Delivery Operations and Activities**

**HNF-5914
Revision 0**

March 2000

This page intentionally left blank.

CONTENTS

1.0	INTRODUCTION.....	1-1
1.1	PURPOSE	1-1
1.2	BACKGROUND AND SCOPE.....	1-1
2.0	HAZARD IDENTIFICATION AND EVALUATION.....	2-1
2.1	METHODOLOGY	2-1
2.2	HAZOP TABLE STRUCTURE.....	2-3
2.3	MAJOR ASSUMPTIONS.....	2-7
3.0	EVALUATION	3-1
3.1	EVALUATION OF HAZARD ANALYSIS INFORMATION.....	3-1
3.2	ISSUES NOTED DURING FEBRUARY 2000 HAZARDS ANALYSIS MEETING.....	3-2
4.0	CONCLUSIONS	4-1
5.0	REFERENCES.....	5-1

LIST OF TABLES

TABLE 2-1.	HAZOP DEVIATION GUIDE.....	2-4
TABLE 3-1.	EXISTING HAZARDOUS CONDITIONS ADDRESSING INCREMENTAL MIXER PUMP LOWERING OPERATIONS.....	3-4

APPENDICES

A	Definition of Waste Feed Envelopes and Node Scheme.....	A-1
B	Team Member Resumes.....	B-1
C	Hazard Evaluation Tables.....	C-1
D	Peer Review Checklist.....	D-1

List of Terms

AB	Authorization Basis
AIChE	American Institute of Chemical Engineers
DST	double-shell tank
FSAR	Final Safety Analysis Report
HazOp	Hazards and Operability Analysis
ID	identification
IWFSTs	intermediate waste feed staging tanks
OCC	occupational
PHA	Preliminary Hazards Analysis
RCSTS	Replacement Cross-Site Transfer System
SSC	structure, system, or component
TSR	Technical Safety Requirement
TWRS	Tank Waste Remediation System
USQ	Unreviewed Safety Question
WFD	Waste Feed Delivery

**Hazard Evaluation for
Waste Feed Delivery Operations and Activities**

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this hazard evaluation is to document hazardous conditions associated with Waste Feed Delivery (WFD) operations and activities. The waste feed delivery system hazards analysis activities considered, as a whole, the existing waste storage tanks, the interconnected piping, and any new equipment that may be installed as part of Project W-211 to accomplish the conditioning and transfer of waste.

This document does not authorize any activities and only provides information about the hazards associated with the activities occurring in the evaluated facilities. The control decision process, as defined in the Authorization Basis (AB), will be used to determine the controls that will be allocated to each identified hazardous condition.

1.2 BACKGROUND AND SCOPE

The hazard analysis results that are documented in this report are from two hazard analysis meetings. The first hazard analysis meeting, which evaluated the bulk of the tanks included in WFD Phase I (Project W-211), was conducted June 15, 16, 17, 19, 22, 23, and 24, 1998. The results were drafted in July 1998, but were not finalized and published. This report includes the information from the June 1998 session.

The scope that was addressed during the first hazard analysis session included only the processing and transfer activities that are delineated as "Privatization Phase I" activities in Section 3 of HNF-SD-WM-SP-012, *Tank Waste Remediation System Operation and Utilization Plan*. Specifically, this first session considered the primary retrieval, conditioning, and transfer of waste out of the following tanks:

- 241-AN-102
- 241-AN-103
- 241-AN-104
- 241-AN-105
- 241-AN-106
- 241-AN-107
- 241-AW-101
- 241-AY-101
- 241-AY-102
- 241-AZ-101
- 241-AZ-102.

Also included was the transfer of waste from the above tanks to intermediate waste feed staging tanks (IWFSTs) 241-AP-102 and 241-AP-104. Transfers and further conditioning to the TWRS-P facility feed tanks 241-AP-106 and 241-AP-108.

The first hazard analysis session considered only the waste material to be conditioned and delivered as Waste Feed Delivery Feed Envelopes A, B, C, and D (HNF-SD-WM-SP-012). A summary of each feed envelope considered is included in Appendix A of this report.

The second hazard analysis meeting was conducted on February 9, 2000. This report also includes the information gathered from this meeting. To address the inclusion of additional waste tanks by Projects W-211 and W-521, the following tanks were evaluated against the baseline information gathered during the first hazards analysis session:

- 241-AN-101
- 241-AP-101
- 241-AW-103
- 241-AW-104
- 241-SY-102
- 241-SY-103.

It should also be noted that an evaluation of Tank 241-SY-101 was not specifically performed, even though it is included as part of the Phase 1B retrieval mission, because this tank is still the subject of an open Unreviewed Safety Question (USQ)¹. Because of this situation, the safety of Tank 241-SY-101 is addressed by separate AB documentation.

¹ French, R. T., 1999, *Contract Number DE-AC06-96RL13200 – Submittal of Updated Unreviewed Safety Question (USQ) Evaluation and Supplemental Controls for Tank 241-SY-101*, (Letter 99-TSD-051 to R. D. Hanson, FDH, April 27), U.S. Department of Energy, Office of River Protection, Richland, Washington.

2.0 HAZARD IDENTIFICATION AND EVALUATION

The hazards identification and evaluation for WFD operations and activities used both the Hazards and Operability Analysis (HazOp) and What-If/Checklist methods. In the HazOp method, a team leader systematically guides the team through the system/process being evaluated using a fixed set of process parameters (e.g., flow, temperature, pressure) and guide words (e.g., high, low, less, more). The combination of the process parameters and guide words are applied at specific points or "nodes" in the system design to identify potential hazardous conditions associated with the operation of the system.

The What-If/Checklist method is a creative, brainstorming examination of a process or operation that is supplemented with previously developed questions regarding the hazards that may be present in the system/operation being reviewed. Each member of the hazards evaluation team is encouraged to verbalize specific "What-if" questions or issues that may be of concern. The What-if/Checklist technique can be used to examine virtually any aspect of facility design and operation. Results of "What-if" analysis address potential accident situations implied by questions and issues posed by the team. These questions and issues are intended to help identify specific causes for the identified accident situations.

The WFD hazards evaluation was performed by an interdisciplinary team to identify process deviations associated with the installation and operation of WFD equipment that could potentially result in undesirable consequences. During the HazOp and What-If/Checklist processes, potential consequences of the deviations were estimated, hazardous conditions formulated, and possible corrective and/or preventive measures identified and discussed. These processes are recognized by the American Institute of Chemical Engineers (AIChE) and are described in AIChE, *Guidelines for Hazard Evaluation Procedures*. The HazOp uses a tabular format to record the results of the systematic process.

Because the HazOp and What-if/Checklist techniques tend to be qualitative in nature, the expertise and experience of the team is of primary importance in establishing the credibility of the analysis. A short resume of each team member participating in the most recent hazard analysis session is included in Appendix B to document the expertise and experience level of each team member.

2.1 METHODOLOGY

The team met to develop the organization of the hazards evaluation process during the first hazards session (June 15, 16, 17, 19, 22, 23, and 24, 1998). During this session, nodes were defined to create a systematic structure within which the WFD processes and operations can be addressed. The node scheme that was developed used the previously defined WFD feed envelopes (HNF-SD-WM-SP-012) and is provided in Appendix A.

During the first hazards analysis session, Waste Feed Envelope A was fully expanded and analyzed. Waste envelopes B, C, and D in contrast, were reviewed by the HazOp team using the Envelope A results as a baseline. Each particular operation or activity in Envelopes B, C, and D was reviewed against the Envelope A results. Differences were noted and the hazards analysis

team session was concluded. Approximately 350 unique hazardous conditions were identified during the meetings.

After the June 1998 team meetings, the hazard analyst expanded, on a line-by-line basis, each entry in Envelopes B, C, and D to match the entries found in the Envelope A results, as appropriate. When this expansion process was complete, the total number of hazardous conditions totaled approximately 3,500. Performance of this process was necessary to ensure that all unique hazardous conditions associated with all of the different WFD feed envelopes were identified. However, a significant quantity of duplicate information resulted from this approach.

To prepare for the WFD Control Decision Meeting in December 1999, the entire expanded database of hazardous conditions was reviewed to "cull" out the duplicate information and retain only the unique hazardous conditions. This operation reduced the total number of WFD hazardous conditions to 352. The information for the 352 hazardous conditions is included in Appendix C, Table C-1. Note that the final number of hazardous conditions closely corresponds to the number of hazardous conditions originally developed during the June 1998 meetings. This shows that the process applied was rigorous and did a good job of identifying the unique hazardous conditions.

Later phases of the safety analysis process for WFD discovered another hazardous condition that may have the potential to affect the facility worker (see Item ID# WFD-42a-001). This hazardous condition is a potential personnel exposure to waste that is present in abovegrade portions of the diluent system and diluent transfer lines. A postulated cause of this hazardous condition is a diluent system pump failure that allows waste to gravity flow into the abovegrade piping. No release of waste or diluent is assumed to occur as part of this hazardous condition.

This item has been added to the WFD hazard analysis database and brings the total number of WFD hazardous conditions to 353. This specific hazardous condition is not shown in Table C-1, however, because it was not developed as part of the initial raw hazards information. It is however, included in Table C-5, "Hazardous Conditions With Potentially Significant Facility Worker Consequences." Controls will be allocated for these 353 hazardous conditions, as appropriate.

In February 2000, the scope of the original hazard analysis was broadened to include additional tanks. The tanks that were evaluated are discussed in Section 1.2. To evaluate each of these additional tanks with respect to the existing hazard analysis results, each tank was reviewed by the hazard analysis team to see if there were distinct differences (positive or negative) over the results previously recorded. The results of this evaluation are presented in Appendix C, Table C-2. Issues noted during this review are discussed later in this document (see Section 3.2).

The following sections describe the hazards evaluation raw data table structure (Table C-1), information recording details, and process node descriptions.

2.2 HAZOP TABLE STRUCTURE

The raw data HazOp table (Appendix C, Table C-1) was structured to ensure a systematic and thorough evaluation of the potential hazards. Table C-1 includes the following information:

Item ID#: The item identification (ID) number that is used to record a unique identifier for the hazardous condition.

Node: Specific point in the system or process where the deviation from the desired condition of a process variable is evaluated. Nodes are chosen to ensure that every area where an undesirable condition could occur is evaluated. See Appendix A for a description of the nodes used in this analysis.

Description: A description of the node being evaluated.

Process Parameter: The characteristics of a process, such as flow, pressure, or temperature, which are used to define proper operation. Process parameters, guide words, and deviations are listed in Table 2-1.

Deviation: Words that describe the variance in the process variable of concern such as high, low, more, or less. A complete summary of variables and guide words is given in Table 2-1.

Possible Causes (or Cause): The causes of the deviation that leads to the hazardous condition. Identifying causes is important to identifying potential preventive or mitigative controls or features for significant hazardous conditions as well as potential consequences. In many cases, multiple hardware or operational faults are required to produce a hazardous condition. This column identifies the sequence of hardware and operational faults required to produce the postulated hazardous condition.

Consequences: The potential consequences that could result from the postulated deviation.

Existing Controls: This column provides a listing of the existing safety structures, systems, or components (SSCs) and Technical Safety Requirements (TSRs) that may currently be in place to either prevent or mitigate the consequences described for the potential deviation. No attempt is made to provide an exhaustive list. The items contained in this column should not be construed as being the “official” controls that may eventually be credited in the AB for this hazardous condition.

Potential Controls: This column provides a listing of potential engineered or administrative controls that may be able to prevent or mitigate the consequences described for the potential deviation. No attempt is made to provide an exhaustive list. The items contained in this column should not be construed as being the “official” controls that may eventually be credited in the AB for this hazardous condition.

Table 2-1. HazOp Deviation Guide.

	Guide Words				
Process Parameter	NO, NOT, NONE	LESS, LOW, SHORT	MORE, HIGH, LONG	PART OF AS WELL AS, ALSO	OTHER THAN, WHERE ELSE
FLOW	No Flow	Low Rate, Low Total	High Rate, High Total	Misdirection, Material in Inappropriate Areas	Contamination, Impurities
PRESSURE	Open to Atmosphere	Low Pressure	High Pressure		Vacuum
TEMPERATURE	Freezing	Low Temperature	High Temperature		Auto-refrigeration
LEVEL	Empty	Low Level	High Level	Low Interface	High Interface
CONFINEMENT	No Confinement	Degraded Confinement			Bypass Pathway
TIME PROCEDURE	Skipped or missing Step	Too Short, Too Little	Too Long, Too Much	Action(s) Skipped (Shortcuts)	Wrong Action Out of Order, Opposite
SPEED	Stopped	Too Slow	Too Fast	Out of Sync	Web or Belt Break Backward
COMPOSITION/ CONCENTRATION	Missing Ingredient	Less Ingredient/ Low Concentration	More Ingredient/ High Concentration	Missing Ingredient	Wrong Ingredient Additional Ingredient
pH		Low pH	High pH		Additional Acid, Additional Base
VISCOSITY		Low Viscosity	High Viscosity		Wrong Acid, Wrong Base
VOLTAGE	No Voltage	Voltage Low	Voltage High	Wrong Waveform	Interference Voltage
CURRENT	No Current	Current Low	Current High		Wrong Frequency, AC instead of DC
STATIC			Static Charge		DC instead of AC
AGITATION	No Mixing	Poor Mixing	Excessive Mixing	Mixing Interruption	Current Fluctuating
REACTION	No Reaction	Slow Reaction	Runaway Reaction	Partial Reaction	Wrong Polarity
STRUCTURAL INTEGRITY	Structural Failure	Less Integrity	More Integrity	Side Reaction	Phase Separation
SHIELDING		Less Shielding	More Shielding		Decomposition
SPECIAL	Utility Failure	External Leak	External Rupture	Tube Leak	Startup, Shutdown, Maintenance

Cons Rank: Consequence Rank - The consequence rank is a code designator for the level of consequence associated with a hazardous condition. The consequence ranking is a "first cut", qualitative estimate of the safety severity of the consequences assuming no controls are present. The following system is used:

- S0 Negligible safety concerns for the facility worker.
- S1 Potential industrial injury, low radiological or chemical exposure dose consequences to the facility worker.
- S2 Potential significant radiological dose consequences or chemical exposure to onsite workers located outside the facility.
- S3 Potential significant radiological dose consequences or chemical exposure to the offsite population.

Freq Rank: Frequency Rank – The frequency rank is a "first cut," qualitative estimate of the likelihood of the hazardous condition assuming no controls are present. The following system is used:

- F3 Events that are expected to occur one or more times during the lifetime of the facility, categorized as "anticipated" events. The frequency range associated with this category is 1E-02/yr to 0.1/yr.
- F2 Events that could occur during the lifetime of the facility, but with low probability. Such events are categorized as "unlikely" and fall in the range of 1E-04/yr to 1E-02/yr.
- F1 Events not expected to occur during the lifetime of the facility, categorized as "extremely unlikely." The frequency range associated with this category is 1E-06/yr to 1E-04/yr.
- F0 Events categorized as "beyond extremely unlikely," with a frequency less than 1E-06/yr. Events in this category (such as meteor strike) are so unlikely they generally do not require special controls.

Env Rank: Environmental Rank – The environmental consequence ranking is a "first cut, "qualitative estimate of the environmental severity of the hazardous condition assuming no controls are present. The following system is used:

- E0 No significant environmental effect outside the facility confinement systems.
- E1 Limited environmental discharge of hazardous material outside the facility.
- E2 Large environmental discharge of hazardous material within the plant site boundary.
- E3 Significant environmental discharges of hazardous material outside the plant site boundary.

Remarks: Miscellaneous observations or clarifying comments for a given item.

Nomenclatures used in Appendix C, Tables C-3, C-4, C-5, and C-6 are consistent with the preceding descriptions.

The following additional nomenclatures are used in Table C-7, Appendix C:

- **Rep Acc** – Representative Accident – An alpha/numeric code used to specify the analyzed FSAR accident by which the specified Hazardous Condition is represented. Only Hazardous Conditions with high Safety Consequence (S2 or S3) are assigned representative accidents.
- **Hazardous Condition** – Hardware failures, operational faults, or conditions that could result in undesired consequences due to WFD operations and activities.
- **Prev SSC** – SSCs from the analyzed accident in the AB, determined by this hazards analysis and the WFD control decision process² to apply to the hazardous condition, that provide a preventive function.
- **Prev TSR** – TSRs from the analyzed accident in the AB, determined by this hazards analysis and the WFD control decision process³ to apply to the hazardous condition, that provide a preventive function.
- **Mit SSC** - SSCs from the analyzed accident in the AB, determined by this hazards analysis and the WFD control decision process⁴ to apply to the hazardous condition, that provide a mitigative function.

² The controls applied to the hazardous conditions shown in Table C-7 reflect the control decision process for Waste Feed Delivery that was conducted in December 1999. While the controls shown are considered to be firm, the report documenting the control decision process for WFD is still in the process of being finalized. Therefore, the controls shown in Table C-7 should not be considered the "official" controls.

³ Ibid.

⁴ Ibid.

- **Mit TSR** – TSRs from the analyzed accident in the AB, determined by this hazards analysis and the WFD control decision process⁵ to apply to the hazardous condition, that provide a mitigative function.
- **Control Memo** – Information provided to understand the source of the controls shown.

The following additional nomenclatures derived from HNF-SD-WM-TI-764, *Hazard Analysis Database Report*, have been used in Appendix B, Table B-8:

- **BIN** – A code that describes the release attributes for high Safety Consequence (S2 and S3) and Worker Hazard (S1) with anticipated frequency (F3) Hazardous Conditions.
- **Cause Grp** – Cause Group - An alpha/numeric code used to permit sorting of data by the cause of a Hazardous Condition.
- **Material at Risk** – A description of the type and quantity (when applicable) of material that may be affected by the occurrence of a Hazardous Condition.

2.3 MAJOR ASSUMPTIONS

The specific assumptions, as developed during the hazards identification /evaluation team meetings, that are unique to this hazard analysis are:

- This hazard analysis does not address criticality issues regarding WFD. Criticality will be addressed in a WFD-specific Criticality Safety Evaluation Report.
- Assumptions specific to the deviation identified in the raw data are included in the "Remarks" column of Table C-1.
- Tank 241-SY-101, even though it is included as part of the Phase 1B retrieval mission, was specifically not evaluated because this tank is still the subject of an open USQ. This tank can be addressed for WFD at a later date by specifically looking at any differences (e.g., new hazards) that may exist over what has already been analyzed in this document.

⁵ Ibid.

This page intentionally left blank.

3.0 EVALUATION

This document is not part of the AB and is not a vehicle for requesting authorization of any activities. It is only intended to identify and categorize hazardous conditions that might result in the uncontrolled release of radiological and toxicological material during WFD operations and activities. The information contained in this report and the subsequent control decisions will be used to develop input to an amendment of the TWRS AB to authorize WFD operations and activities. Information from this hazard evaluation will also be incorporated into the existing FSAR database for more complete coverage of Tank Farm facility hazardous conditions. This hazard evaluation does not constitute an accident analysis.

3.1 EVALUATION OF HAZARD ANALYSIS INFORMATION

A total of 353 unique hazardous conditions were identified as a result of the hazard analysis process. These are shown in Table C-1 of Appendix C. These conditions were found to represent the hazards associated with the scope of WFD, Phase I (see Section 1.2).

Hazardous conditions with a consequence rank of S2 or S3 are assigned representative accidents. A review of the data presented in Table C-1 showed that there were 344 S2 and S3 consequence events. These were grouped according to 11 existing representative accidents.

- Flammable Gas Deflagrations - DST (Rep Acc 04)
- HEPA Filter Failure - Exposure to High Temperature or Pressure (Rep Acc 06)
- Organic Salt-Nitrate Reaction (Rep Acc 09)
- Spray Leak in Structure or from Overground Waste Transfer Lines (Rep Acc 15)
- Spray Leak from Underground Waste Transfer Lines (Rep Acc 16)
- Caustic Spray Leak (Rep Acc 17)
- Tank Bump (Rep Acc 18A)
- Subsurface Leak Resulting in Pool (Rep Acc 21)
- Mixing of Incompatible Material - Toxic Vapor Generation (Rep Acc 23)
- Surface Leak Resulting in Pool (Rep Acc 26)
- Subsurface Leak Remaining Subsurface (Rep Acc 29)

Tables C-3, C-4, C-5 of Appendix C present hazardous conditions grouped by consequence ranking (S3, S2, and S1). No hazardous conditions were assigned the S0 consequence category. These tables contain the Item ID#, Hazardous Conditions, Cause, Frequency Rank (Freq Rank), and Environmental Consequence Rank (Env Rank).

Of the 353 hazardous conditions, 147 were assigned S3 consequences (Table C-3), 197 were assigned S2 consequences (Table C-4), nine (9) were assigned S1 consequences (Table C-5). Of the nine (9) hazardous conditions assigned S1 consequences, eight (8) were shown to be strictly occupational hazards (OCC). These hazardous conditions (i.e., OCCs) are addressed by lower level procedures and controls such as the TWRS Health and Safety Plan. These hazardous conditions are presented in Table C-6.

Table C-7 of Appendix C presents the controls (safety SSCs and TSRs) that were selected as part of the WFD Control Decision Meetings held in December 1999. The controls shown in

this table are still in the finalization process and should not be construed as the approved set of controls for the hazardous conditions. Designation of the final and approved set of controls is outside the scope of this report. Table C-7 contains the Rep Acc, Item ID, Hazardous Conditions, Cause, Prev SSC, Mit SSC, Prev TSR, Mit TSR, Control Memo, Cons Rank, and Freq Rank.

Table C-8 of Appendix C, presents the S2 and S3 category hazardous conditions grouped under the applicable FSAR accident analysis section. This table contains the BIN, Item ID, Material at Risk, Hazardous Conditions, Cause, Freq Rank, Cons Rank, Cause Grp, and Rep Acc. This table is intended to provide objective evidence whether a hazardous condition can be represented by an existing Representative Accident⁶. If a hazardous condition cannot be represented by an existing Representative Accident, then further analysis may be required to determine if a new Analyzed Accident needs to be developed.

In this hazard analysis, all S2 and S3 hazardous conditions can be represented by the following existing Representative/Analyzed Accidents (in order of FSAR appearance):

- FSAR Section 3.3.2.4.2, *HEPA Filter Failure - Exposure to High Temperature or Pressure*
- FSAR Section 3.3.2.4.7, *Subsurface Leak Remaining Subsurface*
- FSAR Section 3.3.2.4.9, *Caustic Spray Leak*
- FSAR Section 3.3.2.4.11, *Mixing of Incompatible Material - Toxic Vapor Generation*
- FSAR Section 3.4.2.2, *Flammable Gas Deflagrations*
- FSAR Section 3.4.2.6, *Organic Salt-Nitrate Reaction*
- FSAR Section 3.4.2.7, *Surface Leak Resulting in Pool*
- FSAR Section 3.4.2.8, *Subsurface Leak Resulting in Pool*
- FSAR Section 3.4.2.9, *Spray Leak in Structure or from Overground Waste Transfer Lines* (includes Spray Leak from Underground Waste Transfer Lines)
- FSAR Section 3.4.2.11, *Tank Bump*

The Representative Accident descriptions, with section titles from the FSAR accident analyses, are also shown in Table C-8.

3.2 ISSUES NOTED DURING FEBRUARY 2000 HAZARDS ANALYSIS MEETING

The results of the hazard analysis meeting held in February 2000 are presented in Table C-2. No new or unique hazardous conditions were discovered. Nonetheless, some important issues were discussed and noted.

A number of potential operational concerns were identified. These included the presence of large foreign objects in the tanks that may impede mixing operations (WFDSY102-6), and the ability of high shear strength (e.g., thick or solid) waste to bind and/or fail mixer pumps and

⁶ The accident analysis performed for Waste Feed Delivery confirmed that all S2 and S3 hazardous conditions could be grouped according to the Representative Accidents shown here. For details of the accident analysis performed see RPP-5070, *Analysis of Waste Leak and Spray Release Accidents From Waste Feed Delivery System Transfers*, RPP-5097, *Analysis of Ventilation System Accidents for Waste Feed Delivery Operations*, and RPP-5098, *Analysis of Waste Leak and Toxic Chemical Release Accidents from Waste Feed Delivery (WFD) Diluent System*.

transfer pumps (WFDAW103-2). These conditions were similar to conditions identified during the original hazards activities and are being considered in the operational plans of Project W-211.

Other conditions related to on-going safety analyses included:

- Potential criticality issues due to high concentrations and quantities of transuranic wastes being moved and stored (WFDAW103-1).
- The presence of higher concentrations of solids being transferred from the 200 West Area to the 200 East Area via the slurry line (WFDSY102-2). This issue is currently being evaluated as part of the safety analysis supporting WFD.
- The potential for a higher (than currently evaluated) waste transfer pressure by using the slurry and booster pumps associated with the Replacement Cross-Site Transfer System (RCSTS) (WFDSY102-3). This issue is currently being evaluated as part of the safety analysis supporting WFD.

One additional issue was raised regarding the incremental lowering of a mixer pump into Tank 241-AW-103 (WFDAW103-3). Mixing of the tank waste may be accomplished by inserting the mixer pump in stages and operating for short periods at each stage. This would promote a gradual mixing of thick waste with a high shear strength and guard against premature mixer pump failure. After reviewing this issue against the previously documented hazard analyses of in-tank equipment installation, operation, and removal (WHC-SD-WM-TI-759, *Hazard Evaluations for the Tank Waste Remediation System Final Safety Analysis Report*), it is judged that this issue is already adequately addressed in the TWRS FSAR. Specific hazardous conditions identified, that could be extended to include this WFD issue, are (by Item ID): ITK-01, ITK-04, ITK-05, ITK-07, ITK-08, ITK-09, and ITK-11. These hazardous conditions are shown in Table 3-1.

Appendix C, Table C-2 includes additional items that were considered during the February 2000 hazards analysis session.

Table 3-1. Existing Hazardous Conditions Addressing Incremental Mixer Pump Lowering Operations.

Item ID#	Hazardous Condition	Cause	Safety Rank	Freq Rank
ITK-01	Radioactive and/or hazardous material release from point of in-tank access (non-fire, non-explosion) due to intrusive activity	Chemical/thermal reaction of materials in equipment/waste	S1	F2
ITK-04	Release of radioactive and/or hazardous material from point of in-tank access (non-fire, non-explosion) due to earthquake or high wind with open access	Seismic event or high wind when access open	S1	F3
ITK-05	Release of radioactive and/or hazardous material from point of in-tank access (non-fire, non-explosion) due to intrusive activity	Tank burps from intrusive activity	S2	F2
ITK-07	Radioactive and/or hazardous material release from tank below grade (non-fire, non-explosion) due to intrusive activity	Dropped equipment in tank from human error or equipment failures (also see crane operations)%Penetration of tank with linear-force, high pressure, or rotational equipment from human error or equipment failure	S1	F3
ITK-08	Release of radioactive material from in-tank fire or explosion due to intrusive activity (dome collapse)	Exothermic reaction of incompatible materials in tank	S3	F3
ITK-09	Release of radioactive material from in-tank fire or explosion due to intrusive activity (dome collapse)	Failure to bond components or incorrect bonding	S3	F3
ITK-11	Release of radioactive material from in-tank fire or explosion due to intrusive activity (dome collapse)	Lightning, range fire, or seismic event ignites tank vapors	S3	F2

4.0 CONCLUSIONS

The hazard evaluation for Waste Feed Delivery identified 353 hazardous conditions. Of these hazardous conditions, 344 were assigned either S2 or S3 consequences. It was found that all 344 hazardous conditions could be grouped according to eleven (11) existing TWRS FSAR accidents. These accidents are:

- Flammable Gas Deflagrations - DST (Rep Acc 04)
- HEPA Filter Failure - Exposure to High Temperature or Pressure (Rep Acc 06)
- Organic Salt-Nitrate Reaction (Rep Acc 09)
- Spray Leak in Structure or from Overground Waste Transfer Lines (Rep Acc 15)
- Spray Leak from Underground Waste Transfer Lines (Rep Acc 16)
- Caustic Spray Leak (Rep Acc 17)
- Tank Bump (Rep Acc 18A)
- Subsurface Leak Resulting in Pool (Rep Acc 21)
- Mixing of Incompatible Material - Toxic Vapor Generation (Rep Acc 23)
- Surface Leak Resulting in Pool (Rep Acc 26)
- Subsurface Leak Remaining Subsurface (Rep Acc 29)

Controls that were developed as part of the control decision process for WFD have been allocated to each hazardous condition, as shown in Table C-7. The control allocation provided in this document is for informational purposes only and should not be considered the final or "official" set of controls for these hazardous conditions. The selection of controls is in the process of being finalized and will be documented in a separate report.

This page intentionally left blank.

5.0 REFERENCES

AIChE, 1992, *Guidelines for Hazard Evaluation Procedures*, American Institute of Chemical Engineers, New York, New York.

French, R. T., 1999, *Contract Number DE-AC06-96RL13200 – Submittal of Updated Unreviewed Safety Question (USQ) Evaluation and Supplemental Controls for Tank 241-SY-101*, (Letter 99-TSD-051 to R. D. Hanson, FDH, April 27), U.S. Department of Energy, Office of River Protection, Richland, Washington.

HNF-SD-WM-SAR-067, 2000, *Tank Waste Remediation System Final Safety Analysis Report*, Rev. 1-D, CH2MHill Hanford Group, Inc., Richland, Washington.

HNF-SD-WM-TI-764, 1999, *Hazard Analysis Database Report*, Rev 2, Lockheed Martin Hanford Corporation, Richland, Washington.

RPP-5070, 1999, *Analysis of Waste Leak and Spray Release Accidents From Waste Feed Delivery System Transfers*, Rev. 0, Fluor Daniel Northwest, Inc., Richland, Washington.

RPP-5097, 1999, *Analysis of Ventilation System Accidents for Waste Feed Delivery Operations*, Rev. 0, Fluor Daniel Northwest, Inc., Richland, Washington.

RPP-5098, 1999, *Analysis of Waste Leak and Toxic Chemical Release Accidents from Waste Feed Delivery (WFD) Diluent System*, Rev. 0, Fluor Daniel Northwest, Inc., Richland, Washington.

WHC-SD-WM-TI-759, 1996, *Hazard Evaluations for the Tank Waste Remediation System Final Safety Analysis Report*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

Appendix A

Definition of Waste Feed Envelopes and Node Scheme

This page intentionally left blank.

Envelope "A"

Envelope "A" consists of wastes contained in tanks 241-AN-103, 241-AN-104, 241-AN-105, and 241-AW-101. A listing and description of the Process Steps for Envelope "A" tanks follows.

PROCESS STEP	DESCRIPTION
Degas Feed	Degas the waste in the feed source tank using an in-tank mixer pump. For degassing, the mixer pump must stir the settled solids adequately to release gas bubbles retained in the waste but gently enough to avoid episodic gas releases and minimize resuspension of settled solids. The degassing operation will be monitored in a similar manner to degassing operations in tank 241-101-SY. Waste degassing is assumed to require 30 days of mixer pump operation.
Settle Solids	Shut down the Mixer pump, and allow any solids suspended during the Degas mixing to settle out of the supernatant. Settling time will be based on lab testing and experience with previous tanks. Settling is assumed to 30 days.
Decant Supernate	Decant (transfer) supernate from the source tank to the Intermediate Waste Feed Staging Tanks (IWFSTs) 241-AP-102 and 241-AP-104, with diluent addition at the transfer pump inlet. Diluent is injected only at the rate necessary to avoid solids formation resulting from waste cooling during the transfer, and to meet waste transfer and receipt composition requirements. Supernate from the source tank will be split approximately equally between the IWFSTs. Solids content of the waste being transferred will be monitored using a turbidity meter or some other in-line instrument. The transfer will be stopped when the solids content reaches a predefined limit, indicating that the supernate/settled solids interface in the source tank has been reached. The transfer pump will be equipped with a variable inlet, adjustable from the maximum tank operating level to within 10 inches of the tank bottom. The pump inlet height will be adjustable while pumping, and will be controlled to minimize entrainment and pickup of solids in the decanted liquid. The transfer pump will have in-line diluent addition capability, to allow for addition of water, or aqueous solutions of NaOH, NaNO ₃ , and/or NaNO ₂ . The diluent addition system will have a capacity adequate to provide a 1/1 dilution ratio (1 part by volume diluent per 1 part by volume undiluted supernate). The transfer pump will not be used during mixer pump operation and it will be designed so that it will not be damaged by mixer pump operation. The current concept is to equip the transfer pump with a load-sensing winch mechanism to eliminate the whipping action applied to the transfer pump during operation of a mixer pump. The transfer system will be instrumented for flow, pressure, density, viscosity, and turbidity, as well as with appropriate motor control instrumentation.

PROCESS STEP	DESCRIPTION
A diluent addition system will be used to provide chemical adjustment of the waste with aqueous solutions of NaOH, NaNO ₃ , and NaNO ₂ . The diluent addition system will be capable of delivering solutions directly to the tanks, and to the in-line dilution systems. Add Diluent to Source Tank	Add diluent to the slurry left in the feed source tank to dissolve more solids. The volume and concentration of the added diluent will be determined by a laboratory-scale process test for each tank. Diluent will be added to tanks through a nozzle in a tank riser, and will be dumped into the vapor space.
Mix Feed	Mix the tank contents using the mixer pump until the soluble solids dissolve. This activity is assumed to take 1 week.
Take Process Control Samples	(This step was considered an activity covered by the BIO, and was not evaluated in this HazOp).
Analyze Process Control Samples	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).
Evaluate Sample Data	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).
Perform Feed Adjustment cost Evaluation & Obtain DOE Approval	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).
Adjust Feed	Adjust the feed by adding more diluent or shimming chemicals, or blending with supernate from other source tanks as approved by DOE.
Mix Feed	Mix the source tank contents using the mixer pump. This activity is assumed to take 7 days.
Settle Solids	Shut down the mixer pump and allow insoluble solids to settle. The solids are assumed to be dense and at a relatively low concentration (5-10 volume% settled) with a fast settling rate. This step is assumed to require 7 days.
Decant Supernate	Decant (transfer) the "new" supernate to the IWFSTs. This operation is a repeat of the Decant (transfer) step described above. If the diluent added above was selected correctly, this transfer should not require in-line dilution.
Mix Feed in the IWFSTs	A mixer pump is used to mix the supernate in each IWFST. This step should be relatively quick, requiring only a few hours to a few days of mixing. This step is assumed to require 7 days.
Take Process Control Samples	(This step was considered an activity covered by the BIO, and was not evaluated in this HazOp).
Analyze Process Control Samples	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).
Evaluate Sample Data	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).

PROCESS STEP	DESCRIPTION
Perform Feed Adjustment cost Evaluation & Obtain DOE Approval	(This step was considered an operation outside the scope of this HazOp, and was not evaluated).
Adjust Staged Feed	Adjust the staged feed by shimming, blending, or restaging as approved by DOE. If after adjustment there is sufficient confidence that the staged feed will be within specification, the process may proceed. If the staged feed does not meet specifications, however, it must be re-mixed and re-analyzed as within specification before proceeding.
Mix Feed in the IWFSTs	A mixer pump is used to mix the supernate in each IWFST. This step should be relatively quick, requiring only a few hours to a few days of mixing. This step is assumed to require 7 days.
Sample Staged Feed	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Provide Samples to Private Contractor	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Analyze Samples	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Interpret Sample Results and Prepare Feed Batch Qualification Report	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Deliver Feed to Private Contractor	Decant (transfer) the supernate from the IWFSTs to the Private Contractor's feed tank(s), 241-AP-106 or 241-AP-108.

NOTE - As the process steps are mostly identical for all Waste Feed Envelopes, the remaining Envelopes will have only the process steps listed, unless characteristics of a particular Envelope require differences in a particular Process step.

Envelope "B"

Waste Feed Envelope "B" waste consists of the initial supernate decanted from Waste Feed Envelope "D" tanks to tank 241-AY-101. Process steps for Waste Feed Envelope "B" are as follows: Decant Supernate, Mix Feed in the IWFSTs, Take Process Control Samples, Analyze Process Control Samples, Evaluate Sample Data, Perform Feed Adjustment cost Evaluation & Obtain DOE Approval, Adjust Staged Feed, Mix Feed in the IWFSTs, Sample Staged Feed, Provide Samples to Private Contractor, Analyze Sample, Interpret Sample Results and Prepare Feed Batch Qualification Report, Provide Feed Batch Qualification Report to Private Contractor, Deliver Feed.

Envelope "C"

Waste Feed Envelope "C" waste in 241-AN Tank Farm consists of Complex Concentrate in tanks 241-AN-102 and 241-AN-107. Tank 241-AN-106 will be used to store concentrated waste from future 242-A Evaporator runs, therefore its' waste designation is currently unknown. The supernate is the targeted waste in all of these tanks. No mixer pump will be used.

Process steps for Waste Feed Envelope "C" are as follows:

PROCESS STEP	DESCRIPTION
Decant Supernate	This decant (transfer) is identical to previous transfers, save for the following: it is anticipated that a fixed inlet transfer pump will be used with the inlet placed about 10 inches above the sludge level in each tank, and the diluent addition system will be used to add 0.65 parts by volume diluent per 1 part by volume undiluted supernate.

Envelope "C" Process steps continue with: Mix Feed in the IWFSTs, Take Process Control Samples, Analyze Process Control Samples, Evaluate Sample Data, Perform Feed Adjustment Cost Evaluation & Obtain DOE Approval, Adjust Staged Feed, Mix Feed in the IWFSTs, Sample Staged Feed, Provide Samples to Private Contractor, Analyze Sample, Interpret Sample Results and Prepare Feed Batch Qualification Report, Provide Feed Batch Qualification Report to Private Contractor, Deliver Feed to private Contractor.

The retrieval scenario for tanks 241-SY-101 and 241-SY-103 (which are also considered part of Waste Feed Envelope C) have not been developed in sufficient detail and therefore were not included in this hazards evaluation.

Envelope "D"

Waste Feed Envelope "D" consists of High-Level Waste (HLW) solids contained in tanks 241-AZ-101, 241-AZ-102, and 241-AY-102. Initial supernate from these tanks will be pumped to tank 241-AY-101 to become Waste Feed Envelope "B".

Process steps for Waste Feed Envelope "D" are as follows:

PROCESS STEP	DESCRIPTION
Decant Supernate	Supernate from tank 241-AZ-101 will be transferred to tank 241-AY-101. A portion of the supernate from tank 241-AZ-102 will be transferred to 241-AY-101 to top off the tank; the remainder of 241-AZ-102 supernate will be transferred to tank 241-AN-104. Supernate from tank 241-AY-102 will be transferred to tank 241-AN-105. The diluent addition system will be used to add 1 part by volume diluent per 1 part by volume undiluted supernate.
Add Sludge Wash Solution	Sludge wash solution will be added to the slurry in the HLW feed source tank. The wash solution (0.1molar NaOH, 0.01molar NaNO ₂) is added in a 1:1 dilution ratio with the settled solids volume. Wash solutions will be added through a nozzle in a tank riser and will dump into the vapor space. Alternatively, an "enhanced" sludge washing may be performed: NaOH and NaNO ₂ will be added to bring the waste to 0.1molar NaOH, 0.01molar NaNO ₂ , then the washing will be enhanced by heating the slurry within the tank.
Mix Feed	Tank contents will be mixed using a mixer pump until soluble solids dissolve. This step is assumed to require five days.
Take Process Control Samples	Process Control samples will be taken immediately after the mixer pump is shut down. This step was considered to be an activity covered by the BIO, and was not evaluated in this HazOp.
Analyze Process Control Samples	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Evaluate Sample Data	(This step was considered to be an operation outside the scope of this HazOp, and was not evaluated).
Settle Solids	After the mixer pumps are shut down to allow process control sampling, the solids are allowed to settle prior to further processing. Progress of settling will be monitored using ultrasonic interface level analyzers and/or gamma profiles in drywells. Settling is assumed to require 30 days.
Decant Supernate	Decant (transfer) the supernate wash solution to the appropriate storage DST: The supernate from tanks 241-AZ-101, 241-AZ-102, and 241-AY-102 are transferred to tanks 241-AW-105, 241-AN-105 and 241-AN-105 respectively.
Adjust Feed	Performed only if required, and if approved by DOE. See above.

PROCESS STEP	DESCRIPTION
Add Transfer Solution	An inhibited-water solution is added to the HLW feed tank to dilute the solids below the maximum slurry concentration of 100 g/L waste oxides, and to meet other waste transfer requirements. Due to tank space limitations in tank 241-AY-102, additional transfer solution may need to be added in-line during the transfer.
Simultaneous Mix and Transfer	Feed tanks' contents are simultaneously mixed using a mixer pump, and transferred directly to the private vitrification contractor's facility (not to tanks 241-AP-106 or 241-AP-108).

Waste Feed Delivery Nodes from Original HazOp.		
Node	Description	Notes
L1A	In-tank mixer pump operation	Envelop A, Batch 1, Source Tanks: 103-AN, 104-AN, 105-AN, 101-AW
L1B	Settling of solids after mixer pump operation	--
L1C	Pump transfer (with diluent addition) to 102 and 104AP	--
L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	--
L1E	Mix sludge and added diluent using mixer pump	--
L1F	Adjust contents of tank as necessary by adding additional water, shimming chemicals or supernate from other tank sources	--
L1G	Mix adjusted feed using mixer pump	--
L1H	Settling of solids after mixer pump operation	--
L1I	Pump transfer (with diluent addition) to 102 and 104AP	--
L1J	Waste feed tanks residuals as-left condition	--
L1K	Mix supernate in 102 and 104AP using mixer pump to prepare for process control sampling	--
L1L	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	--

Waste Feed Delivery Nodes from Original HazOp.		
Node	Description	Notes
L1M	Mix supernate in 102 and 104AP using mixer pump to prepare for turnover sampling	--
L1N	Settling of solids after mixer pump operation	--
L1O	Pump transfer of supernate from 102 and 104AP to 106 or 108AP	--
L1P	102 and 104AP residuals as-left condition	--
L2A	Pump transfer of source tank supernate to 102 and 104AP	Feed Envelope B, Batch 1, Source Tank: 101-AY
L2B	source tank feed residuals	--
L2C	In-tank mixer pump operation in 102 and 104AP	--
L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	--
L2E	In-tank mixer pump operation in 102 and 104AP	--
L2F	Settling of solids in 102 and 104AP after mixer pump operation	--
L2G	Pump transfer of waste from 102 and 104AP to contractor	--
L2H	102 and 104AP residuals	--
L2A	Pump transfer of source tank supernate to 102 and 104AP	Envelope C, Batch 1, Source Tank: 102-AN, 106-AN, 107-AN (same as nodes in Envelope B)
L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Envelope D, Batch 1, Source Tanks: 102-AY, 101-AZ, 102-AZ
L4B	Add sludge wash solution/diluent to HLW feed tanks	--
L4C	Mix HLW feed tanks using mixer pumps	--

Waste Feed Delivery Nodes from Original HazOp.		
Node	Description	Notes
L4D	Sample HLW feed tank immediately after shutting down mixer pump	--
L4E	Settle HLW feed tanks	--
L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	--
L4G	Adjust HLW feed tanks' composition	--
L4H	Add transfer solution to dilute slurry in HLW feed tanks	--
L4I	Simultaneously mix and transfer (with diluent addition) HLW feed tanks' contents directly to contractor facility	--
L4J	HLW feed tanks' residuals	--
L4K	WHAT IF: aging waste is transferred to non-aging waste tanks, which are not equipped to deal with the excess heat load of the aging waste material?	--

Appendix B

Team Member Resumes

This page intentionally left blank.

Hazard Analysis Team Biographical Information

James W. Ficklin, Plant Engineer - Twenty-one years of maintenance experience in the nuclear industry. The last seven years have been in the Maintenance Program Integration group at Tank Farms. Former Plant Maintenance Manager at the 100-N Reactor and at the K Basins Spent Nuclear Fuel Storage Facility. Intimately familiar with new construction, reliability-centered maintenance, as well as preventive, predictive, and corrective maintenance. Have authored administrative and technical procedures, preventive maintenance data sheets, and have supported development of several WFD documents such as the O&M Concept, RAM Analysis, etc.

Thomas G. Goetz, - B.S. Physics. Over 21 years of experience at commercial and DOE nuclear facilities with the last 8 years focused primarily on safety analysis and licensing support at Savannah River and Hanford. Served as Licensing Engineer for numerous tasks including Project W-058, (Replacement Cross-Site Transfer System), Rotary Mode Core Sampling, and FSAR Phase 1 Implementation. Primary author of BIO/FSAR Addendum 2 (Replacement Cross-Site Transfer System) and Addendum 5 (Reconciliation of Rotary Mode Core Sampling) and other safety documents including calculation notes, engineering studies, and licensing strategy documents.

David M. Hammond, B.S. Nuclear Engineering. More than 14 years of nuclear experience including testing of Naval Nuclear Reactor Systems and DOE Safety Analysis. Mr. Hammond is currently employed in the Nuclear Safety & Licensing group of TWRS Technical Operations and Engineering. He has been providing Safety Analysis support at Hanford and Savannah River Site for nine years. His experience includes development and technical review of Safety Analysis Reports for Savannah River Site and Lawrence Livermore National Laboratories and development and technical review of supporting safety analysis documentation including Preliminary Hazards Analyses, Hazards Assessment Documents, and Engineering Calculations.

Edward M. Nordquist - B.S. Mechanical Engineering. Nineteen years construction experience as both project engineer and project manager plus five years as a piping/HVAC support engineer. Author of numerous documents at Hanford for the support contractors to support project activities from beginning to the end. These include functional design criteria, conceptual design reports, construction specifications and drawings, acceptance test procedures and reports, acceptance for beneficial use, and official acceptance of construction. As project manager, worked as single point of contact with DOE on project activities.

Curt Rieck – B.S. Construction Management, B.A. Business Administration. Eighteen years experience in the management of approximately twenty nuclear-related construction projects, including existing facility upgrades and new facilities.

Grant W. Ryan, PE - B.S. Physics, B.S. Nuclear Engineering, PE Mechanical Engineering. Nine years experience in nuclear facility safety analysis and general engineering support. Author of numerous documents at Hanford to support safe operations. These have included operating and alarm response procedures, safety analysis reports (TWRS BIO, TWRS FSAR), calculation notes, topical reports, and engineering studies.

Milton V. Shultz, Jr. – B.S. Nuclear Engineering Technology. Facilitator for the PHA. More than twenty-four years experience in a broad range of engineering and technical assignments at the Hanford Site. Experience includes leading PHAs and HAZOPs for a variety of TWRS projects, including several for the TWRS FSAR and BIO efforts, contributor to the hazards analysis work for the TWRS BIO. Has performed independent Nuclear Safety evaluations of reactor plant design and operation at Hanford's N Reactor.

William L. Willis, - B. S. Chemical Engineering. Ten years experience at Hanford, 2 at PUREX/UO₃ Plant, 6 at Spent Nuclear Fuels Project, 2 in tank farms waste feed delivery. Have authored or co-authored numerous documents at Hanford to support safe operations, environmental permitting, and operational readiness. These include evaluation of continued use of the U-14 Ditch, UO₃ Plant Shutdown plan, Radionuclide inventory of the K-Basins, Notices of Construction for Spent Nuclear Fuel project facilities, Summary Description Document for the Readiness to Proceed with Tank Farms Privatization, Tank Farm Assessments of AN, AP, AW, AY, and AZ tank farms, and Alternative Generation and Analysis for specific tank farm issues.

Other team members in attendance were Al Erhart, Del Scott, and Katie White.

**Appendix C
Hazard Evaluation Tables**

This page intentionally left blank.

List of Tables

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data.....	TC1-1
Table C-2. Revised Scope - Waste Feed Delivery System/W211 HazOp Raw Data.....	TC2-1
Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).....	TC3-1
Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).....	TC4-1
Table C-5. Hazardous Conditions With Potentially Significant Worker Consequences (S1).....	TC5-1
Table C-6. Hazardous Conditions With Potential Occupational (OCC) Safety Consequences.	TC6-1
Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences.	TC7-1
Table C-8. Analyzed Accidents and the Represented Hazardous Conditions.	TC8-1

This page intentionally left blank.

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-01a-005	L1A	In-tank mixer pump operation	Gas evolution rate	NO: no gas is evolved.	surface crust prevents gas passage	allows buildup of unacceptable flammable gas levels leading to a Gas Release Event (GRE) followed by deflagration	existing flammable gas and ignition source controls	requiring softening or breaking of crust before mixer pump operation		S3	F1	E3								
WFD-01a-006	L1A	In-tank mixer pump operation	Gas evolution rate	NO: no gas is evolved.	surface crust prevents gas passage	unacceptable GRE leading to tank overpressurization and a toxic expo-sure within the facility	operable primary ventilation system	continuously monitor tank pressure and respond to deviations		S1	F3	E1								
WFD-01a-007	L1A	In-tank mixer pump operation	Gas evolution rate	NO: no gas is evolved.	surface crust prevents gas passage	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system	continuously monitor tank pressure and respond to deviations		S2	F2	E2								
WFD-01a-017	L1A	In-tank mixer pump operation	Gas evolution rate	LESS: less gas is evolved than expected.	crust is semi-permeable	allows buildup of unacceptable flammable gas levels leading to a Gas Release Event (GRE) followed by deflagration	existing flammable gas and ignition controls	requiring softening or breaking of crust before mixer pump operation begins		S3	F1	E3	[expand this for the toxic & HEPA events]							
WFD-01a-018	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	more gas retained in waste than theoretically expected	unacceptable GRE leading to tank overpressurization and a toxic expo-sure within the facility	operable primary ventilation system	continuously monitor tank pressure and respond to deviations		S1	F3	E1								
WFD-01a-019	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	more gas retained in waste than theoretically expected	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system	continuously monitor tank pressure and respond to deviations		S2	F2	E2								
WFD-01a-022	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	more gas retained in waste than theoretically expected	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank, start up mixer pumps slowly, with the first one at low speed		S3	F1	E3								
WFD-01a-025	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	mixer pump operation too aggressive	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank		S3	F1	E3								

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

							S1	F3	E1
WFD-01a-026	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	mixer pump operation too aggressive	unacceptable GRE leading to tank overpressurization and a toxic expo-sure within the facility	operable primary ventilation system	continuously monitor tank pressure and respond to deviations	
WFD-01a-027	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	Mixer pump operation too aggressive	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system	continuously monitor tank pressure and respond to deviations	
WFD-01a-028	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	waste mixing is more efficient than expected	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank	
WFD-01a-029	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	waste mixing is more efficient than expected	unacceptable GRE leading to tank overpressurization and a toxic expo-sure within the facility	operable primary ventilation system	continuously monitor tank pressure and respond to deviations	
WFD-01a-030	L1A	In-tank mixer pump operation	Gas evolution rate	MORE: more gas is evolved than expected.	waste mixing is more efficient than expected	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system	continuously monitor tank pressure and respond to deviations	
WFD-01b-001	L1A	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	extended mixer pump operation	tank bump	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	
WFD-01b-002	L1A	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	extended mixer pump operation	runaway chemical reactions	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-01b-003	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	chemical reactions	tank bump	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1
WFD-01b-004	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	chemical reactions	runaway chemical reactions	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1
WFD-01b-005	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	inadequate primary ventilation flow	tank bump	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1
WFD-01b-006	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	inadequate primary ventilation flow	runaway chemical reactions	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1
WFD-01b-007	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	failure of primary ventilation system	tank bump	existing LCO on primary ventilation system; existing LCO and safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	waste solids congregate in "dead zones"	tank bump	existing LCO & safety limits related to temperature	none	S2	F1
	LIA	In-tank mixer pump operation	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	waste solids congregate in "dead zones"	runaway chemical reactions	existing LCO & safety limits related to temperature	none	S2	E1
WFD-01b-013										
WFD-01b-014										
WFD-02a-004	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of existing lines) and an underground spray leak	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	none	S3	F2
WFD-02a-005	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of existing lines) and an aboveground spray leak	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	none	S3	F2

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS		(1) NO.	CLASS		(2) WORK		(3) REVERSE		ACTION		GAS WELL LAS		OTHER HAN		Date:
Item No.	Node	Description	Process Element	Causes	Possible Consequences	Consequence	Existing Protection	Control Protection	Con.	Event Rank	Freq.	Env.	Rank	Remarks	
WFD-02a-006	L1B	Setting of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned			
WFD-02a-007	L1B	Setting of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned			
WFD-02a-008	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines			
WFD-02a-009	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines			
WFD-02a-010	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	potential line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines			
WFD-02a-012	L1B	Settling of solids after mixer pump operation	Solids content of supernate layer	MORE: more suspended solids in supernate than anticipated	solids settle in tank less quickly than anticipated	increased erosion of transfer lines	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F1	E3				

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-02b-004	L1B	Setting of solids after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	higher than expected gas generation rate	unacceptable GRE followed by deflagration	WAC-required tank level monitoring	continuously monitor and trend tank level for increase during in tank settling of solids	S3	F1	E3
WFD-02b-006	L1B	Setting of solids after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	higher than expected gas generation rate	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system (control) in place for steady-state flammable gas buildup)	continuously monitor tank pressure and respond to deviations, continuously monitor and trend tank level for increase during in tank settling of solids	S2	F1	E2
WFD-02b-007	L1B	Setting of solids after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	solids trap greater than expected amount of gas during in tank settling	unacceptable GRE followed by deflagration	WAC-required tank level monitoring	continuously monitor and trend tank level for increase during in tank settling of solids	S3	F2	E3
WFD-02b-009	L1B	Setting of solids after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	solids trap greater than expected amount of gas during in tank settling	unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system (control) in place for steady-state flammable gas buildup)	continuously monitor tank pressure and respond to deviations, continuously monitor and trend tank level for increase during in tank settling of solids	S2	F2	E2
WFD-02c-003	L1B	Setting of solids after mixer pump operation	Waste temperature increase during in tank settling of solids	MORE: higher waste temperature increase than expected	insulating factor due to fluffing greater than expected	tank bump	existing LCO & safety limits related to temperature	restart in-tank waste mixing equipment when a temperature increase is noted	S2	F1	E1

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

							S2	F1	E1	
WFD-02c-004	L1B	Settling of solids after waste mixer pump operation	Waste temperature increase during in tank settling of solids	MORE: higher waste temperature increase than expected	insulating factor due to fluffing greater than expected	runaway chemical reactions	existing LCO & safety limits related to temperature	restart in-bank waste mixing equipment when a temperature increase is noted		
WFD-03a-002	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/freezing of diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2
WFD-03a-003	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/freezing of diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2
WFD-03a-004	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/freezing of diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3
										E3

RPP-5914 REV 0

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-005	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/ff freezing of diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-006	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/ff freezing of diluent line	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-007	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/ff freezing of diluent line	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-008	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/ff freezing of diluent line	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-009	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	plugging/ff freezing of diluent line	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-011	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-012	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-013	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-014	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-015	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-016	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

ID	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-017	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-018	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-020	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-021	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-022	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-023	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	E2
WFD-03a-024	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2
WFD-03a-025	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2
WFD-03a-026	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	E2
WFD-03a-027	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	E2
										ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Location	Event ID	Event Description	Initial Condition	Initial Hazard	Control Measure	Assumption
WFD-03a-029	L1C	Pump transfer (with diluent addition) to 102 and 104AP	NO: no diluent flow during transfer pumping	Diluent addition	decision to not add diluent to a particular transfer	<p>potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak</p> <p>none</p> <p>Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection</p> <p>ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned</p>
WFD-03a-030	L1C	Pump transfer (with diluent addition) to 102 and 104AP	NO: no diluent flow during transfer pumping	Diluent addition	decision to not add diluent to a particular transfer	<p>potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak</p> <p>none</p> <p>Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection</p> <p>ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer</p>

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-031	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-032	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-033	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	\$3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-034	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	\$3	F2	E3	ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer
WFD-03a-035	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer
WFD-03a-036	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-038	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-039	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-040	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-041	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-042	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	Potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-043	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	Potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03a-044	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	Potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-045	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	restriction in diluent line	Potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03a-053	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	equipment malfunction in startup of diluent addition	Potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Line Item	WFD-03a-065	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-066	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

							S2	F3	E2	
WFD-03a-067	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection		ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-068	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection		ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-069	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3
WFD-03a-070	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3
WFD-03a-071	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2
WFD-03a-072	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-090	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an underground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-091	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
												NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-092	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03a-093	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

ITEM	DESCRIPTION	CAUSE	CONTROLS	EQUIPMENT	TESTS	MONITORING	NOTES
WFD-03a-094	L1C Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	\$3 F2 E3 ASSUMPTION: using new W-314 lines NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-03a-095	L1C Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	\$3 F2 E3 ASSUMPTION: using new W-314 lines NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-03a-096	L1C Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	\$2 F3 E2 ASSUMPTION: using new W-314 lines NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-03a-097	L1C Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	\$2 F3 E2 ASSUMPTION: using new W-314 lines NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03a-098	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3
WFD-03a-100	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in GRE leading to overpressurization of tank and HEPA filter failure	none	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-03a-101	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-03a-103	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions causing damage to diluent system resulting in release of toxic vapors	none	Verify chemical composition before mixing diluent batch	S2	F3	E2
WFD-03a-104	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions causing damage to diluent system resulting in personnel injury	none	Verify chemical composition before mixing diluent batch	S1	F3	E1
											NOTE: This is an environmental concern, but is also considered an industrial safety concern.

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03e-010	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3
								"LOWER" used here as analogue of "LESS"			
WFD-03c-011	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3
								"LOWER" used here as analogue of "LESS"			
WFD-03c-012	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
								"LOWER" used here as analogue of "LESS"			

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

							S2	F3	E2	ASSUMPTION:
WFD-03c-013	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "LOWER" used here as analogue of "LESS"
WFD-03c-014	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"
WFD-03c-015	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"
WFD-03c-016	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"
WFD-03c-017	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-006		LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	misrouting	pool leak of waste	AC 5.12	engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S2	E3	E2	NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.
WFD-03d-007		LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	misrouting	spray leak of waste when structure being leaked into fills and begins to leak	AC 5.12	engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S3	F3	E3	NOTE: spray leak can occur at many locations; see BIO 5.3.2.20.
WFD-03d-009		LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Process ID	Process Name	Event Description	Initial Condition	Control	Action	Assumption						
WFD-03d-010	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "LOWER" used here as analogue of "LESS"
WFD-03d-011	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "LOWER" used here as analogue of "LESS"
WFD-03d-012	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Line No.	Pump transfer (with diluent addition) to 102 and 104AP	LIC	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	E2	E3	ASSUMPTION: using new W-314 lines
WFD-03d-013												"LOWER" used here as analogue of "LESS"
WFD-03d-014		LIC	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03d-015		LIC	Transfer line pressure (with diluent addition) to 102 and 104AP	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03d-016		LIC	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03d-017		LIC	Transfer line pressure (with diluent addition) to 102 and 104AP	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	longer transfer time leads to more gas buildup in source tank leading to an unacceptable GRE followed by deflagration	AC 5.12 none and ignition source controls		S3	F1	E3	"LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-019	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	longer transfer time leads to more gas buildup in source tank leading to an unacceptable GRE leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation on system (control in place for steady-state flammable gas buildup)	none	\$2	F1	E2
WFD-03d-021	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3
WFD-03d-022	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-023	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
								"LOWER" used here as analogue of "LESS"			
WFD-03d-024	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
								"LOWER" used here as analogue of "LESS"			
WFD-03d-025	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3
								"LOWER" used here as analogue of "LESS"			
WFD-03d-026	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3
								"LOWER" used here as analogue of "LESS"			

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-027	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"
WFD-03d-028	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines "LOWER" used here as analogue of "LESS"
WFD-03d-033	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of, though this is not currently planned ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak "LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-034	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	E3
								ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	F2	
								"LOWER" used here as analogue of "LESS"		
WFD-03d-035	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	E2
								ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	F3	
								"LOWER" used here as analogue of "LESS"		

RPP-5914 REV 0

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-036	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-037	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-038	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3
									ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak		ASSUMPTION: using new W-314 lines
WFD-03d-039	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2
									ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak		ASSUMPTION: using new W-314 lines
WFD-03d-040	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2
									ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak		ASSUMPTION: using new W-314 lines
											"LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-041	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	spray leak	AC 5.12 & LCO 3.1.1	none	S3	F3	E3	"LOWER" used here as analogue of "LESS"
WFD-03d-042	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	pool leak	AC 5.12 & LCO 3.1.3	none	S2	F3	E2	"LOWER" used as overflow of pit rather than direct leak to ground.
WFD-03d-044	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak "LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-045	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi sourting	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3
								ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned			
WFD-03d-046	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi sourting	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
								ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned			
							"LOWER" used here as analogue of "LESS"				
								ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak			
								"LOWER" used here as analogue of "LESS"			

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-047	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi strouting	potential transfer line plugging leading to mechanical line failure (existing lines) and an above-ground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-048	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi strouting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS		(1) NO		(2) LESS		(3) MORE		(4) PART OF		(5) SWHL AS		(6) GOF		Date
Item No.	Node	Description	Process Parameter	Deriv.	Possible Cause	Consequence	Existing Controls	Proactive	Consequence	Initial	Final	End	Start	Comments
WFD-03d-049	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	E3	ASSUMPTION: using new W-314 lines	"LOWER" used here as analogue of "LESS"	ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak
WFD-03d-050	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines	"LOWER" used here as analogue of "LESS"	ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak
WFD-03d-051	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines	"LOWER" used here as analogue of "LESS"	ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-052	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi strouting	spray leak	AC 5.12 & LCO 31.1	none	S3	F3	E3	"LOWER" used here as analogue of "LESS"
WFD-03d-053	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi strouting	pool leak	AC 5.12 & LCO 31.3	none	S2	F3	E2	"LOWER" used as overflow of pit or tank rather than direct leak to ground.
WFD-03d-057	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-058	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	"HIGHER" used here as analogue of "MORE"
												ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-059	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-060	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-061	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: "HIGHER" used here as analogue of "MORE"
WFD-03d-062	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 times

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-063	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03d-064	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03d-065	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (existing lines) and an underground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "HIGHER" used here as analogue of "MORE"
WFD-03d-066	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-067	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (existing lines) and an underground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-068	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-069	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-03d-070	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines
												"HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-071	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-03d-072	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	"HIGHER" used here as analogue of "MORE"
WFD-03d-073	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	excessively fast transfer: rapid decrease in hydrostatic head leads to an unacceptable GRE resulting in deflagration	AC 5.12	perform independent verification of pump speed setting before transfer	S3	F1	E3	ASSUMPTION: using new W-314 lines
WFD-03d-074	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	excessively fast transfer: rapid decrease in hydrostatic head leads to an unacceptable GRE leading to tank overpressurization and a toxic exposure within the facility	operable primary ventilation system (control in place for steady-state flammable gas buildup)	perform independent verification of pump speed setting before transfer	S1	F3	E1	"HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-075	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	excessive fast transfer: rapid decrease in hydrostatic head leads to an unacceptable GRE E leading to tank overpressurization and a failure of HEPA filters leading to an onsite radiological release	operable primary ventilation system (control in place for steady-state flammable gas buildup)	perform independent verification of pump speed setting before transfer	NOTE: THIS event is where the previously deferred events are picked up. "HIGHER" used here as analogue of "MORE"
WFD-03d-077	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an underground spray leak	AC 5.12	Engineered overpressurization protection devices	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "HIGHER" used here as analogue of "MORE"
WFD-03d-079	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12	Engineered overpressurization protection devices	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-080	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-081	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03d-082	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03d-083	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03d-084	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-086	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an underground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-087	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3 "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-088	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
												NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

WFD-03d-089	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
												NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Line ID	Line No.	Description	Initial Condition	Event	Consequence	AC 5.12	S3	F2	E3	Assumption:
WFD-03d-090	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none		using new W-314 lines
WFD-03d-091	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none		NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"
WFD-03d-092	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none		NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-093	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12	none	S2	F3	E2
WFD-03d-095	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS	CONC.	(2) LESS		SAS		WET AS		OTHER		DR.	
		Process Duration	Description	Postis-	Preis-	Existing Control	Post Control	E1	E2	E3	DR.
WFD-03d-096	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12 Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-097	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12 Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-098	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-099	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-100	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines	NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"
WFD-03d-101	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines	NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"
WFD-03d-102	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines	NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

ITEM NUMBER	DESCRIPTION	PUMP TYPE	TRANSFER LINE PRESSURE	HIGHER: higher pressure than expected in transfer line	WASTE RHEOLOGY	MATERIAL LINE FAILURE (EXISTING LINES) AND AN UNDERGROUND SPRAY LEAK	AC 5.12	ENGINEERED OVERPRESSURIZATION PROTECTION DEVICES	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03d-103	LIC Pump transfer (with diluent addition) to 102 and 104 AP											NOTE: rheology changes can include changes in density, viscosity, solids content, etc.
WFD-03d-104	LIC Pump transfer (with diluent addition) to 102 and 104 AP											"HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-105	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	mechanical line failure (existing lines) and an underground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
												NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

WFD-03d-106	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
												NOTE: rheology changes can include changes in density, viscosity, solids content, etc. "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03d-107	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3
WFD-03d-108	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3
WFD-03d-109	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	the failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2

Table C.1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03-d-110	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines
												NOTE: rheology changes can include changes in density, viscosity, solids content, etc.
												"HIGHER" used here as analogue of "MORE"
WFD-03c-012	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in source tank	MORE: source tank level high	misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, leakage	overfilling source tank leading to surface pool leak	AC 5.12, AC 5.21, LCO 3.1.3	Assure diluent flow does not exceed transfer pump flow during transfer	S2	F2	E2	
WFD-03c-014	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	misrouting: human error or mechanical malfunction	pool leak of waste	AC 5.12	none	S2	F3	E2	NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.
WFD-03c-015	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	misrouting: human error or mechanical malfunction	spray leak of waste when structure being leaked into fills and begins to leak	AC 5.12	none	S3	F3	E3	NOTE: spray leak can occur at many locations; see BIO 5.3.2.20.
WFD-03c-018	L1C	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	transfer line leak	pool leak of waste	AC 5.12, LCO 3.1.3	none	S2	F3	E2	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03e-019	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	transfer line leak	spray leak	AC 5.12, LCO 3.1.1	none	S3	F3	E3
WFD-03e-021	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Liquid level in intermediate waste feed tank	MORE: intermediate waste feed tank level is high	misrouting of simultaneous transfer or flush, or leakage, extended transfer duration	overfilling intermediate waste feed tank leading to surface pool leak	AC 5.12, AC 5.21, LCO 3.1.3	Assure diluent flow does not exceed transfer pump flow during transfer	S2	F3	E2
WFD-03f-001	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F1	E2
											NOTE: This is not a concern in TK-102-AP, but also in TK-106-AN, as part of Envelope "C" feed.

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03F-006	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical line failure (existing lines) and an underground spray leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	E3 ASUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-03F-007	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical line failure (existing lines) and an aboveground spray leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	E3 ASUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DESCRIPTIONS		PROCESS STAGE		POSSIBLE HAZARD		POSSIBLE CONSEQUENCE		CONTROLS		COMMENTS	
Line No.	Description	Process Stage	Intermediate	AS WELL AS:	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical line failure (existing lines) and an underground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2
WFD-03f-008	L1C	Pump transfer (with diluent addition) to 102 and 104 AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown							"HIGHER" used here as analogue of "MORE"
WFD-03f-009	LIC	Pump transfer (with diluent addition) to 102 and 104 AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown		possible temperature increases leading to mechanical line failure (existing lines) and an aboveground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03f-010	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible temperature increases leading to mechanical line failure (of newly-installed lines) and an underground spray leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S3	F2	E3	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03f-011	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible temperature increases leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S3	F2	E3	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-03f-012	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible temperature increases leading to the failure (of newly-installed lines) and an underground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-03f-013	LIC	Pump transfer (with diluent addition) to 102 and 104AP	Intermediate Waste Feed composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2	ASSUMPTION: using new W-314 lines "HIGHER" used here as analogue of "MORE"
WFD-04a-001	LID	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	NO: no diluent is added to tank	decision made to add no diluent to tank	drying of sludge followed by heating causing runaway chemical reactions leading to tank overpressurization with unfiltered releases	LCO 3.3.2	Add diluent to assure solids "heir" remains moist	S3	F2	E3	NOTE: This is not a concern in TK-102-AP, but also in TK-106-AN, as part of Envelope "C" feed.
WFD-04a-003	LID	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	NO: no diluent is added to tank	misrouting of diluent	overfilling destination tank leading to surface pool leak	AC 5.12, AC 5.21, LCO 3.1.3	IV of diluent routing, tank level monitoring	S2	F3	E2	
WFD-04a-004	LID	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	NO: no diluent is added to tank	equipment mal-function: pump failure, diluent line plug/freeze , diluent line break	diluent spray or pool leak	AC 5.23	None	S2	F3	E2	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-04a-010	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	MORE: more diluent than expected is added to tank	human error in diluent system operation	overfill Envelope A Feed Tank leading to surface pool leak	none	IV of diluent routing, tank level monitoring	S2	F3	E2
WFD-04a-012	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	MORE: more diluent than expected is added to tank	equipment malfunction	overfill Envelope A Feed Tank leading to surface pool leak	none	IV of diluent routing, tank level monitoring	S2	F3	E2
WFD-04a-014	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	PART OF: decrease in diluent concentration	incorrect caustic batch composition	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3
WFD-04a-016	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	PART OF: decrease in diluent concentration	incorrect caustic batch composition	unexpected chemical reactions resulting in GRE leading to overpressurization of tank and HEPA filter failure	none	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-04a-017	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	PART OF: decrease in diluent concentration	insufficient volume of caustic	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-04a-019	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	PART OF: decrease in diluent concentration	insufficient volume of caustic	unexpected chemical reactions resulting in GRE leading to overpressurization of tank and HEPA filter failure	none	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-04a-023	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3
WFD-04a-025	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in GRE leading to overpressurization of tank and HEPA filter failure	none	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-04a-027	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-04a-028	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in overheating of waste leading to runaway chemical reactions	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S3	F1	E3

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-04a-029	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	REVERSE: waste flowing back into dilution system	siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farms to AW Farm	spray leak of waste from caustic addition system	none	assure backflow prevention in place in diluent addition lines; don't allow diluent addition between farms	S2	F3	E2	ASSUMPTION: Siphon can only happen if dilution flow from AN, AY, or AZ Farm routed to in-line dilution or back through pump in AW Farm, and diluent pump fails or is shut down and system is not valved out.
WFD-04a-030	L1D	Add diluent in preparation of dissolution of the sludge remaining after first decant	Volume	REVERSE: waste flowing back into dilution system	siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farm to AW Farm	pool leak of waste from caustic addition system	none	assure backflow prevention in place in diluent addition lines; don't allow diluent addition between farms	S1	F3	E1	ASSUMPTION: Siphon can only happen if dilution flow from AN, AY, or AZ Farm routed to in-line dilution or back through pump in AW Farm, and diluent pump fails or is shut down and system is not valved out.
WFD-05b-010	L1E	Mix sludge and added diluent using mixer pump	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	inadequate annulus ventilation flow	runaway chemical reactions	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1	
WFD-06a-027	L1F	Adjust contents of tank as necessary by adding additional water, shimming chemicals or supernate from other tank sources	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S2	F1	E2	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-08a-035	L1F	Adjust contents of tank as necessary by adding additional water, shimming chemicals or supernate from other tank sources	Volume	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S2	F1 E2
WFD-09a-018	L1I	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	NO: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3 E2
WFD-09a-031	L1I	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3 E2
										ASSUMPTION: using new W-314 lines
										ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
										ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-09a-050	LII	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-09a-066	LII	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-09a-069	LII	Pump transfer (with diluent addition) to 102 and 104 AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Waste Feed Delivery System	W211 HazOp Raw Data	Description	Event	Initial Condition	Consequence	Control	Test	Review	Assumption		
WFD-09a-072	L11	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	E2	ASSUMPTION: using new W-314 lines
WFD-09a-70	L11	Pump transfer (with diluent addition) to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S3	F2	ASSUMPTION: decision to transfer with less diluent was not based on adequate evaluation of particular transfer
WFD-09b-013	L11	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-09b-018	L11	Pump transfer (with diluent addition) to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	"LOWER" used here as analogue of "LESS"
									E2	ASSUMPTION: using new W-314 lines	"LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-09c-006		LII	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	misrouting	pool leak of waste	AC 5.12	engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S2	F3	E2	NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.
WFD-09c-052		LII	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/misrouting	spray leak	AC 5.12 & LCO 3.1.1	none	S3	F3	E3	"LOWER" used here as analogue of "LESS"
WFD-09c-109		LII	Pump transfer (with diluent addition) to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	ne failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	ASSUMPTION: using new W-314 lines
		LIIJ	Waste feed tanks residuals as-left condition	Liquid content in source tank residuals	NO: no liquid remains in residual solids/sludge in source tank	evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	drying of sludge followed by heating causing runaway chemical reactions leading to tank overpressurization with unfiltered releases	LCO 3.3.2	Add diluent to assure solids "heel" remains moist	S3	F3	E3	NOTE: rheology changes can include changes in density, viscosity, solids content, etc.
WFD-10a-001		LIIJ	Waste feed tanks residuals as-left condition	Liquid content in source tank residuals	NO: no liquid remains in residual solids/sludge in source tank	evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	sudden water addition to overheated dry residuals leading to tank bump	LCO 3.3.2	Add diluent to assure solids "heel" remains moist; strictly control water addition if residual tank solids' temperatures are high	S3	F2	E3	ASSUMPTION: tank residuals at this point concentrate heat-generating materials.
WFD-10a-002		LIIJ	Waste feed tanks residuals as-left condition	Liquid content in source tank residuals	NO: no liquid remains in residual solids/sludge in source tank	evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years							ASSUMPTION: tank residuals at this point concentrate heat-generating materials.

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-12a-001	L1L	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	NO: no diluent is added to tank	decision made to add no diluent to tank	drying of sludge followed by heating causing runaway chemical reactions leading to tank overpressurization with unfiltered releases	LCO 3.3.2	Add diluent to assure solids "heel" remains moist	S3	F2	E3
											NOTE: For supernate additions, this mode is considered within the current Authorization Basis addressing waste transfers.
WFD-12a-027	L1L	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2	Verify chemical composition before mixing diluent batch	S2	F1	E2
WFD-15b-039	L1O	Pump transfer of supernate from 102 and 104AP to 106 or 108AP	Transfer line pressure	LOWER: lower pressure than expected in transfer time	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3
											ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
											"LOWER" used here as analogue of "LESS"

Table C-1 Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS		(1) NO		(2) LESS		(3) MORE		(4) PART OF		(5) REVERSE		(6) OTHER THAN		Date
Item/Dev	Name	Sequence	Process	Condition	Reason	Condition	Reason	Condition	Reason	Condition	Reason	Condition	Reason	Env. Rank
WFD-15c-012	L1O	Pump transfer of supernate from 102 and 104AP to 106 or 108AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical failure (of newly-installed lines) and an underground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2	ASSUMPTION: using new W-314 lines	"HIGHER" used here as analogue of "MORE"	
WFD-17a-022	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of, though this is not currently planned		
WFD-17a-031	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of, though this is not currently planned		

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17a-067	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	LESS; less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
WFD-17a-068	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	LESS; less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Event ID	Event Description	Lesser Diluent Addition	Diluent addition	Potential Transfer Line	Instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	Assumption: using new W-314 lines
WFD-17a-071	L2A Pump transfer of source tank supernate to 102 and 104AP	LESS: less diluent flow during transfer pumping than expected	Diluent addition	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none			ASSUMPTION: decision to transfer with less diluent was not based on adequate evaluation of particular transfer
WFD-17a-072	L2A Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	decision to minimize diluent addition to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	Assumption: using new W-314 lines
WFD-17a-074	L2A Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	MORE: more diluent flow than expected during transfer pumping	equipment malfunction during diluent addition	overfills Envelope B Feed tank	level and material balance monitoring during transfer	S2	F1	Assumption: decision to transfer with less diluent was not based on adequate evaluation of particular transfer
WFD-17a-076	L2A Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	MORE: more diluent flow than expected during transfer pumping	procedural/human error during diluent addition	overfills Envelope B Feed tank	level and material balance monitoring during transfer	S2	F1	Assumption: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17a-092		L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than KOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an underground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-17a-095		L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than KOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-17a-096		L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	OTHER THAN: diluent other than KOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17a-097	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-17a-103	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Diluent addition	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions causing damage to diluent system resulting in release of toxic vapors	none	Verify chemical composition before mixing diluent batch	S2	F3	E2	NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-17c-006	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	pool leak of waste	AC 5.12	engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S2	F3	E2	NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17c-011	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	potential transfer line plugging leading to mechanical line failure (existing lines) and an underground pool leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-17c-017	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line leading to lower than expected transfer flow	equipment malfunction	longer transfer time leads to more gas buildup in source tank leading to an unacceptable GRE followed by deflagration	AC 5.12 and ignition source controls	none	S3	F1	E3	"LOWER" used here as analogue of "LESS"
WFD-17c-042	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	pool leak	AC 5.12 & LCO 3.1.3	none	S2	F3	E2	"LOWER" used here as analogue of "LESS"
WFD-17c-052	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	spray leak	AC 5.12 & LCO 3.1.1	none	S3	F3	E3	NOTE: evaluated as overflow of pit rather than direct leak to ground. "LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17c-068	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	valve closure	mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12	Engineered overpressurization protection devices	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	"HIGHER" used here as analogue of "MORE"
WFD-17c-073	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	excessively fast transfer: rapid decrease in hydrostatic head leads to an unacceptable GRE resulting in deflagration	AC 5.12 and ignition source controls	perform independent verification of pump speed setting before transfer	S3	F1	E3	NOTE: THIS event is where the previously deferred events are picked up.	"HIGHER" used here as analogue of "MORE"
WFD-17e-005	L2A	Pump transfer of source tank supernate to 102 and 104AP	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	transfer line leak	pool leak of waste	AC 5.12, LCO 3.13	none	S2	F3	E2		
WFD-17f-001	L2A	Pump transfer of source tank supernate to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to unexpected chemical reactions resulting in overheating of waste leading to tank bump	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F1	E2	NOTE: This is not a concern in TK-102-AP, but also in TK-106-AN, as part of Envelope "C" feed.	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-17f-008	L2A	Pump transfer of source tank supernate to 102 and 104AP	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	possible temperature increases leading to mechanical line failure (existing lines) and an underground pool leak	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F3	E2
								"HIGHER" used here as analogue of "MORE"			
								NOTE: This is not a concern in TK-102-AP, but also in TK-106-AN, as part of Envelope "C" feed.			
WFD-19a-005	L2C	In-tank mixer pump operation in 102 and 104AP	Gas evolution rate	NO: no gas evolved.	surface crust prevents gas passage	allows buildup of unacceptable flammable gas levels leading to a Gas Release Event (GRE) followed by deflagration	existing flammable gas and ignition source controls	requiring softening or breaking of crust before mixer pump operation	S3	F1	E3
WFD-19a-017	L2C	In-tank mixer pump operation in 102 and 104AP	Gas evolution rate	LESS: less gas is evolved than expected.	crust is semi-permeable	allows buildup of unacceptable flammable gas levels leading to a Gas Release Event (GRE) followed by deflagration	existing flammable gas and ignition source controls	requiring softening or breaking of crust before mixer pump operation begins	S3	F1	E3
WFD-19a-022	L2C	In-tank mixer pump operation in 102 and 104AP	Gas evolution rate	MORE: more gas is evolved than expected.	more gas retained in waste than theoretically expected	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank, start up mixer pumps slowly, with the first one at low speed	S3	F1	E3

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-19a-025	L2C	In-tank mixer pump operation in 102 and 104 AP	Gas evolution rate	MORE: more gas is evolved than expected.	mixer pump operation too aggressive	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank	S3	F1	E3				
WFD-19a-028	L2C	In-tank mixer pump operation in 102 and 104 AP	Gas evolution rate	MORE: more gas is evolved than expected.	waste mixing is more efficient than expected	unacceptable GRE followed by deflagration	existing flammable gas and ignition source controls	continuously monitor quantity of gas released from tank	S3	F1	E3				
WFD-19b-012	L2C	In-tank mixer pump operation in 102 and 104 AP	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	failure of annulus ventilation system	runaway chemical reactions	existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1				
WFD-20a-008	L2D	Adjust contents of 102 and 104 AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	LESS: less diluent than expected is added to tank	misrouting of diluent	overfilling destination tank leading to surface pool leak	AC 5.12, AC 5.21, LCO 3.1.3	IV of diluent routing, tank level monitoring	S2	F3	E2				
WFD-20a-010	L2D	Adjust contents of 102 and 104 AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	MORE: more diluent than expected is added to tank	human error in diluent system operation	overfill Envelope B Feed Tank leading to surface pool leak	none	IV of diluent routing, tank level monitoring	S2	F3	E2				

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-20a-012	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	MORE: more diluent than expected is added to tank	equipment malfunction	overfill Envelope B Feed Tank leading to surface pool leak	none	IV of diluent routing, tank level monitoring	S2	F3	E2	
WFD-20a-014	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	PART OF: decrease in diluent concentration	incorrect caustic batch composition	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3	
WFD-20a-017	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	PART OF: decrease in diluent concentration	insufficient volume of caustic	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data (99 Sheets)

WFD-20a-023	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	AS WELL AS: increase in diluent concentration	excess volume of caustic	unexpected chemical reactions resulting in GRE leading to deflagration	Verify chemical composition before mixing diluent batch	S3	F1	E3	
WFD-22b-004	L2F	Settling of solids in 102 and 104AP after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	higher than expected gas generation rate	unacceptable GRE followed by deflagration	WAC-required tank level monitoring	S3	F1	E3	
WFD-22b-007	L2F	Settling of solids in 102 and 104AP after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	solids trap greater than expected amount of gas during in tank settling	unacceptable GRE followed by deflagration	WAC-required tank level monitoring	S3	F2	E3	
WFD-23a-032	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
											ASSUMPTION: decision to transfer without diluent was not based on adequate evaluation of particular transfer

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-23-a-063	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	LESS: less diluent flow during transfer pumping than expected	procedural/ human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2	ASSUMPTION: using new W-314 lines
WFD-23-a-093	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-23-a-098	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3	NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-23c-006	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	misrouting	pool leak of waste	AC 5.12	engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S2	F3	E2

GLOBAL NOTE: additional consequences of misroutings include:
overfilling of tank receiving misrouted flow;
gas deflagration due to possible unauthorized global waste disturbing activity;
reactions due to chemical incompatibilities. These are addressed by the existing Authorization Basis.

NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-23c-024	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2
											ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "LOWER" used here as analogue of "LESS"
WFD-23c-051	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi sourting	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2
											ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak "LOWER" used here as analogue of "LESS"
WFD-23c-058	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	line pluggage leading to deadheading of the pump	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3
											ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned "HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS		(1)NO (2)LESS (3)MORE		POSSIBLE CAUSE		EXISTING CONTROLS		POTENTIAL CONTROLS		CMLS		OTHER THAN CMLS		REASONS	
Item #	Description	Process Parameter	Deviation	Pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12	none	S2	F3	E2	F1	S2	F1	E2	Remarks
WFD-23c-083	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	AC 5.12	none								"HIGHER" used here as analogue of "MORE"
WFD-23f-001	L2G	Pump transfer of waste from 102 and 104AP to contractor	Intermediate Waste Feed tank waste composition	AS WELL AS: exact chemical composition of wastes in source and/or receiving tanks are unknown	possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	LCO 3.3.2, AC 5.12	sample all materials in tanks (solids and liquids) before transfers occur and test for compatibility problems; remove phosphate ring from receiving tank if found to exist	S2	F1	E2					NOTE: This is not a concern in TK-102-AP, but also in TK-106-AN, as part of Envelope "C" feed.
WFD-26a-012	L2A	Diluent addition	No: no diluent flow during transfer pumping	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3					ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-26a-050	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	LESS: less diluent flow during transfer pumping than expected	equipment malfunction in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2				ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Line No.	Line ID	Description	Initial Condition	Event	Consequence	Control	Action	Comments
WFD-26a-086	L2A	Pump transfer of source tank supernate to 102 and 104AP	Diluent addition	REVERSE: waste is routed back into diluent addition system via the flush line while transfer pump is operating	human error; failure of flush line valves AND pressure switches	pool leak of waste from caustic addition system	LCO 3.1.2	assure backflow prevention in place in diluent addition lines
WFD-26b-018	L2A	Pump transfer of source tank supernate to 102 and 104AP	Supernate temperature	LOWER: supernate temperature decreases during transfer	transfer piping at lower temperature than supernate	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution
WFD-26c-047	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection
WFD-26c-052	L2A	Pump transfer of source tank supernate to 102 and 104AP	Transfer line pressure	LOWER: lower pressure than expected in transfer line	transfer line valve failures/mi routing	spray leak	AC 5.12 & LCO 3.1.1	"LOWER" used here as analogue of "LESS"
								ASSUMPTION: consequences and frequencies evaluate the line plugging, not the line leak
								"LOWER" used here as analogue of "LESS"
								"LOWER" used here as analogue of "LESS"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DRAWDOWN ITEM NO.	CROSS REF	Process Description	POSSIBLE CAUSES		TRIGGERING CONDITIONS		ASSESSMENT OF HAZARD		CONTROLS		COMMENTS
			(1) LESS PROBABLE	(2) MORE PROBABLE	(3) LESS SEVERE	(4) MORE SEVERE	(5) OTHER THAN ASSESSMENT	(6) OTHER THAN ASSESSMENT	(7) DUE TO	(8) DUE TO	
WFD-26c-060	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground pool leak	AC 5.12 Engineered overpressurization protection devices	S2	F3	E2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned
WFD-26c-073	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	excessively fast transfer: rapid decrease in hydrostatic head leads to an unacceptable GRE resulting in deflagration	AC 5.12 perform independent verification of pump speed setting before transfer and ignition source controls	S3	F1	E3	NOTE: THIS event is where the previously deferred events are picked up.
WFD-26c-083	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground pool leak	AC 5.12 none	S2	F3	E2	"HIGHER" used here as analogue of "MORE"
WFD-26c-084	L2A	Pump transfer of source tank supernate to 102 and 104 AP	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	AC 5.12 none	S2	F3	E2	ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS	Q1 NO.	Description	Process Deviation	Process Control	S1 AS WELL AS		S1 AS WELL AS OTHER THAN		Comments	F1	F2	F3	E1	E2	E3	Remarks	
					(1) LESS	(2) MORE	(3) MORE	(4) LESS									
WFD-26e-002	L2A	Pump transfer of source tank supernate to 102 and 104AP	L1ESS: intermediate waste feed tank level low	misrouting: human error or mechanical malfunction	spray leak of waste when structure being leaked into fills and begins to leak	AC 5.12	none										NOTE: spray leak can occur at many locations; see BIO 5.3.2.20.
WFD-28b-005	L2C	In-tank mixer pump operation in 102 and 104AP	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	inadequate primary ventilation flow	tank bump			existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1				
WFD-28b-007	L2C	In-tank mixer pump operation in 102 and 104AP	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	failure of primary ventilation system	tank bump			existing LCO on primary ventilation system; existing LCO and safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1				
WFD-28b-009	L2C	In-tank mixer pump operation in 102 and 104AP	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	inadequate annulus ventilation flow	tank bump			existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1				
WFD-28b-011	L2C	In-tank mixer pump operation in 102 and 104AP	Waste Temperature	MORE: increasing waste temperature with Mixer pump operation	failure of annulus ventilation system	tank bump			existing LCO & safety limits related to temperature	shut down in-tank waste mixing and/or heat-generating equipment when annulus ventilation system fails	S2	F1	E1				

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-29a-001	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	NO: no diluent is added to tank	decision made to add no diluent to tank	drying of sludge followed by heating causing runaway chemical reactions leading to tank overpressurization with unfiltered releases	LCO 3.3.2	Add diluent to assure solids "heel" remains moist
WFD-29a-004	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	NO: no diluent is added to tank	equipment malfunction: pump failure, diluent line plug/freeze , diluent line break	diluent spray or pool leak	AC 5.23	None
WFD-29a-010	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimming chemicals, or supernate from other tank sources	Volume	MORE: more diluent than expected is added to tank	human error in diluent system operation	overfill Envelope A Feed Tank leading to surface pool leak	IV of diluent routing, tank level monitoring	None

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-29a-012	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimmying chemicals, or supernate from other tank sources	Volume	MORE: more diluent than expected is added to tank	equipment malfunction	overfill Envelope A Feed Tank leading to surface pool leak	none	IV of diluent routing, tank level monitoring	S2	F3	E2
WFD-29a-032	L2D	Adjust contents of 102 and 104AP as necessary by adding additional water, shimmying chemicals, or supernate from other tank sources	Volume	OTHER THAN: diluent other than XOH, XNO2, or XNO3 added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions resulting in GRE leading to deflagration	flammable gas and ignition source controls	Verify chemical composition before mixing diluent batch	S3	F1	E3
WFD-31b-004	L2F	Settling of solids in 102 and 104AP after mixer pump operation	Gas retention rate of solids during in tank settling	MORE: more gas buildup during settling in tank than expected	higher than expected gas generation rate	unacceptable GRE followed by deflagration	WAC-required tank level monitoring	continuously monitor and trend tank level for increase during in tank settling of solids	S3	F1	E3
WFD-32a-035	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	NO: no diluent flow during transfer pumping	decision to not add diluent to a particular transfer	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	instrumentation to monitor supernate before pumping, in-line dilution	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2
WFD-32a-062	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	LESS: less diluent flow during transfer pumping than expected	procedural/human error in startup of diluent addition	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an underground pool leak	instrumentation to monitor supernate before pumping, in-line dilution	instrumentation to monitor supernate before pumping, in-line dilution	S2	F3	E2

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

STATIONS	NOTES	SCENARIOS	TRIGGERS	INITIAL CONDITIONS	PROBLEMS	ASSESSMENT	CONTROLS	REMARKS
WFD-32a-094	L2G	Pump transfer of waste from 102 and 104AP to contractor	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-32c-042	L2G	Pump transfer of waste from 102 and 104AP to contractor	Transfer line pressure	LOWER: lower pressure than expected in transfer line	small transfer line leak	pool leak	AC 5.12 & LCO 3.1.3	"LOWER" used here as analogue of "LESS" NOTE: evaluated as overflow of pit rather than direct leak to ground.
WFD-32e-001	L2G	Pump transfer of waste from 102 and 104AP to contractor	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	misrouting: human error or mechanical malfunction	pool leak of waste	AC 5.12	none NOTE: pool leak can occur at many locations; see BIO 5.3.2.18.
WFD-32e-005	L2G	Pump transfer of waste from 102 and 104AP to contractor	Liquid level in intermediate waste feed tank	LESS: intermediate waste feed tank level low	transfer line leak	pool leak of waste	AC 5.12, LCO 3.1.3	none NOTE: pool leak
WFD-35a-009	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Diluent addition	NO: no diluent flow during transfer pumping	plugging/freezeing of diluent line	potential transfer line plugging leading to mechanical line failure (of newly-installed lines) and an aboveground pool leak	none	instrumentation to monitor supernate before pumping, in-line dilution ASSUMPTION: using new W-314 lines

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DESCRIPTION	QUANTITY	PROCESS	AS WELL AS OTHER THAN		E2	E3	E2	E3
			1	2				
WFD-35a-068	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Diluent addition	LESS: less diluent flow during transfer pumping than expected	potential transfer line decision to minimize diluent addition to a particular transfer	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2
							ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	E2
WFD-35a-103	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions causing damage to diluent system resulting in release of toxic vapors	Verify chemical composition before mixing diluent batch	S2
								E2
WFD-35d-007	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure	NO: no pressure in transfer line downstream of point of misrouting	misrouting	spray leak of waste when structure being leaked into fills and begins to leak	AC 5.12 engineered overpressurization protection devices; limit pump speed to limit maximum output pressure	S3
								E3
							NOTE: spray leak can occur at many locations; see BIO 5.3.2.20.	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

DEVIATIONS		(1) NO		(2) LESS		(3) MORE		(4) PART OF SYSTEM		(5) REVERSE		(6) OTHER THAN SYSTEM		(7) GATHERER	
Item ID	Note	Process Change	Deviation	Possible Cause	Consequence	Exposure Control	Control	Env.	Health	Risk	Env.	Health	Control	Remarks	
WFD-35d-052	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure LOWER:	transfer line valve failure/mi strouting	spray leak	AC 5.12 & LCO 3.1.1	none	S3	F3	E3	LOWER used here as analogue of LESS				
WFD-35d-082	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure HIGHER:	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines	HIGHER used here as analogue of MORE			
WFD-35d-087	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure HIGHER:	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned				
											NOTE: rheology changes can include changes in density, viscosity, solids content, etc.			"HIGHER" used here as analogue of "MORE"	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-35d-090	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-35d-091	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an aboveground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines
WFD-35e-012	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	Liquid level in source tank	MORE: source tank level high	misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage	overfilling source tank leading to surface pool leak	AC 5.12, AC 5.21, LCO 3.1.3	Assure diluent flow does not exceed transfer pump flow during transfer	S2	F2	E2	"HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

Waste Type	Location	Event Description	Liquid Level	Misroutings:	Action	Control	Exposure	Exposure	Exposure	Exposure	Exposure	Note
WFD-35F-015	L4A	Pump transfer of initial supernate from HLW feed tanks to 101AY (which becomes the Envelope B feed)	LESS: intermediate waste feed tank	human error or mechanical malfunction	spray leak of waste when structure being leaked into fills and begins to leak	AC 5.12	none	S3	F3	E3	NOTE: spray leak can occur at many locations; see BIO 5.3.2.20.	
WFD-39a-001	L4D	Sample HLW feed tank immediately after shutting down mixer pump	N/A	N/A	aerosolized waste exposure to facility worker (high radiological dose, possible toxic vapor exposure)	LCO	complete containment during sampling, specialized sampling instructions	S1	F3	E1		
WFD-40b-004	L4E	Settle HLW feed tanks	Gas retention rate of solids during in tank settling	higher than expected gas generation rate	unacceptable GRC followed by deflagration	WAC-required tank level monitoring	continuously monitor and trend tank level for increase during in tank settling of solids	S3	F1	E3		
WFD-41a-014	L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	Diluent addition	NO: no diluent flow during transfer pumping	potential transfer line malfunction in startup of diluent addition	none	instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S2	F3	E2	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-41a-091	L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	Diluent addition	OTHER THAN: diluent other than XOH, XNO ₂ , or XNO ₃ added	mislabeled chemical used for supply of diluent, human error	unexpected chemical reactions leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12, LCO 3.1.1, LCO 3.1.3	Verify chemical composition before mixing diluent batch	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	
													NOTE: includes direct chemical action on the transfer line as well as mechanical failure from line plugging
WFD-41d-022	L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	Transfer line pressure	LOWER: lower pressure than expected in transfer line	incorrect transfer pump speed setting	potential transfer line plugging leading to mechanical line failure (existing lines) and an aboveground spray leak	none	Instrumentation to monitor supernate before pumping, in-line dilution, engineered over-pressure protection	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	
													"LOWER" used here as analogue of "LESS"
WFD-41d-081	L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	pump speed setting too high	increased erosion of transfer line walls leading to mechanical line failure (of newly-installed lines) and an underground spray leak	AC 5.12	none	S3	F2	E3	ASSUMPTION: using new W-314 lines	
													"HIGHER" used here as analogue of "MORE"

Table C-1. Waste Feed Delivery System/W211 HazOp Raw Data. (99 Sheets)

WFD-4 id-087	L4F	Pump transfer of HLW feed tank supernate to LAW tanks 105AW and 105AN	Transfer line pressure	HIGHER: higher pressure than expected in transfer line	waste rheology not as expected	increased erosion of transfer line walls leading to mechanical line failure (existing lines) and an aboveground spray leak	AC 5.12	Engineered overpressurization protection devices	S3	F2	E3	ASSUMPTION: New transfer pumps used on old lines (lines between AW & A farms - lines are rated at lower pressures than new pumps are capable of), though this is not currently planned	NOTE: rheology changes can include changes in density, viscosity, solids content, etc.	"HIGHER" used here as analogue of "MORE"
--------------	-----	---	------------------------	--	--------------------------------	--	---------	--	----	----	----	---	--	--

This page intentionally left blank..

Table C-2. Revised Scope - Waste Feed Delivery System/W211 HazOp Raw Data. (2 Sheets)

DEVIATIONS:		DUE LESS THAN OTHER THAN		DUE MORE THAN OTHER THAN		(4) PART OF HAZOP		(5) AS WELL AS		(6) DATE	
Item ID#	Note	Process Variable	Description from existing HAZOp	Possible Causes	Consequences	Existing Controls	Potential Controls				
WFD SY102-1	Tank	Transfer route	Uses cross-site transfer line (slurry line)	No other tanks were "cross-site" and slurry	Higher transfer line pressures Uses booster pumps (Questions on current analysis adequacy)	N/A	N/A	No further HAZOP work needed beyond RCSTS HAZOP that currently exists.	Tank 241-SY-102 is the current staging tank and is currently being used for cross-site transfers.	9 February 2000	
WFD SY102-2	Tank	Source term	High TRU	Current condition	Needs to be verified that current source term is okay.	N/A	N/A	Analysis will be adjusted to address slurry line pressures, appropriate source term, and solids content.	Tank contains significant quantities of TRU waste.		
WFD SY102-3	Tank	Spray leak consequence	Greater consequences	Higher transfer pressure	Verify and address the appropriate pressures.	N/A	N/A	Analysis is planned to address this issue.			
WFD SY102-4	Tank	Back flow volume	Potentially greater consequences	N/A	N/A	N/A	N/A	Considered to be addressed as part of the current analysis (similar situation).	Diluent system is prior to the booster pumps.		
WFD SY102-5	Tank	Diluent system	N/A	N/A	N/A	N/A	N/A	Diluent system currently being used for Tank 241-SY-101 transfers may be used for waste feed delivery.	Diluent system is prior to the booster pumps.		
WFD SY102-6	Tank	Large foreign objects	Potential mixing problem	N/A	N/A	N/A	N/A	Considered in previous HAZOP for WFD (241-AW-101). Found to be an operational concern rather than a nuclear safety concern.	Tank 241-SY-103 will be an Envelope A tank.		
WFD SY103-1	Tank	Transfer route	Route	Not implemented	No significant impact (consider in analysis)	N/A	N/A	Might be overground or pits may be refurbished.			
WFDAW103-1	Tank	Waste compatibility	High TRU cladding removal waste	Current condition	Potential for criticality.	N/A	Potential need for mixing	Criticality will evaluated as part of the on-going analysis.			
WFDAW103-2	Tank	Waste compatibility	High shear strength waste	Thick, solid waste (current condition)	N/A	N/A	Incrementally lowering mixer pump into waste.	TRU waste, in general, not unique. High quantity.	Potential for mixer pump failure if mixer pump is just lowered in and then started. Mainly an operational problem.		
							Add dilution water to inlet of mixer pump.	Potential for process delay.			

Table C-2. Revised Scope - Waste Feed Delivery System/W211 HazOp Raw Data. (2 Sheets)

DEVIATIONS:		(1) NO, (2) LESS OTHER THAN	(3) MORE (7) REVERSE	(4) PART OF (8) AS WELL AS	(6) Date: 9 February 2000			
Item ID#	Note	Process Variable	Description (from existing HAZOp)	Possible Causes	Consequences	Existing Controls	Potential Controls	Remarks
WFDAW103-3	Tank	Waste compatibility	High shear strength waste	Incremental lowering of mixer pump into tank	Change seismic response of tank due to incremental mixer pump lowering.	N/A	N/A	Need to evaluate this issue as part of the design activities for this tank.
WFDAW103-4	Tank	Waste compatibility	Particulate size larger than other tanks	Current condition	Potential for higher than "normal" transfer rates.	N/A	N/A	May require higher transfer rates, however, these transfer rates are bounded by what has already been analyzed/authorized.
WFDAW103-5	Tank	Staging/waste combination with other tanks.	Creating new higher heat loads in other tanks.	Nature of waste	Need to analyze the conditions that may occur.	N/A	AC 5.12 (Waste Compatibility)	Need to do analysis if a legitimate concern.
WFDAW104-1	Tank	Transfer route	None	N/A	N/A	N/A	N/A	No differences noted.
WFDAW104-2	Tank	Waste composition	None	N/A	N/A	N/A	N/A	Issues and conditions similar to those identified for Tank 241-AW-103.
WFDAW104-3	Tank	Want to be Watch List Tank	None	N/A	N/A	N/A	N/A	Keep a watchful eye on this tank for changing conditions.
WFDAN101-1	Tank	Transfer route	None	N/A	No special conditions or attributes.	N/A	N/A	No differences noted.
WFDAN101-1	Tank	Waste composition	Will be used to reduce sulfates in waste by adding water or caustic. (AN-101 to/from AN-104)	N/A	Operational issue only.	N/A	N/A	Tank to tank transfers are already addressed in current analysis.
WFDAN101-2	Tank	Function of tank will evolve	Will become a staging tank for WFD to TWRS-P Facility	N/A	Operational issue only	N/A	N/A	—
WFDAPI01-1	Tank	Transfer route	Needs new transfer pump.	N/A	No impact.	N/A	N/A	No differences noted.
WFDAPI01-2	Tank	Waste composition	Same as already evaluated	N/A	N/A	N/A	N/A	No differences noted.

Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)

Item ID #	Hazardous Conditions	Cause	FCCD Rank	EMI Rank
WFD-01a-005	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Surface crust prevents gas passage (Ignition source assumed present)	F1	E3
WFD-01a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Crust is semi-permeable (Ignition source assumed present)	F1	E3
WFD-01a-022	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	More gas retained in waste than theoretically expected (Ignition source assumed present)	F1	E3
WFD-01a-025	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Mixer pump operation too aggressive (Ignition source assumed present)	F1	E3
WFD-01a-028	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Waste mixing is more efficient than expected (Ignition source assumed present)	F1	E3
WFD-02a-004	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line that leads to mechanical failure of the transfer line	F2	E3
WFD-02a-005	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	F0	E3
WFD-02a-008	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	F2	E3
WFD-02a-009	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	F2	E3
WFD-02a-012	Release of tank waste to soil and/or atmosphere from a leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	F1	E3
WFD-02b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Higher than expected gas generation rate (Ignition source assumed present)	F1	E3
WFD-02b-007	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of degassed waste	Solids trap greater than expected amount of gas during in tank settling (Ignition source assumed present)	F2	E3
WFD-03a-002	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Plugging/freezing of diluent line	F0	E3
WFD-03a-003	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Plugging/freezing of diluent line	F0	E3
WFD-03a-006	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Plugging/freezing of diluent line	F2	E3
WFD-03a-007	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Plugging/freezing of diluent line	F2	E3
WFD-03a-011	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	F0	E3
WFD-03a-012	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	F0	E3
WFD-03a-015	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F2	E3
WFD-03a-016	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F2	E3

**Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)**

ID	Hazardous Conditions	Cause	Freq Rank	Env Rank
WFD-03a-020	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F0	E3
WFD-03a-021	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F0	E3
WFD-03a-024	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F2	E3
WFD-03a-025	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F2	E3
WFD-03a-029	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	F0	E3
WFD-03a-030	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	F0	E3
WFD-03a-033	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F2	E3
WFD-03a-034	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F2	E3
WFD-03a-038	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Restriction in diluent line	F0	E3
WFD-03a-039	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Restriction in diluent line	F0	E3
WFD-03a-042	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Restriction in diluent line	F2	E3
WFD-03a-043	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Restriction in diluent line	F2	E3
WFD-03a-065	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0	E3
WFD-03a-066	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0	E3
WFD-03a-069	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	E3
WFD-03a-070	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	E3
WFD-03a-085	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Human error; failure of flush line valves AND pressure switches results in reverse flow of waste into diluent system	F3	E3
WFD-03a-090	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	E3
WFD-03a-091	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	E3
WFD-03a-094	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	E3
WFD-03a-095	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	E3
WFD-03a-098	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1	E3

Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)

Item ID #	Hazardous Conditions	Cause	Freq Rank	Env Rank
WFD-03c-010	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0	E3
WFD-03c-011	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0	E3
WFD-03c-014	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F2	E3
WFD-03c-015	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F2	E3
WFD-03d-007	Release of tank waste to atmosphere from a spray leak due to misrouting	Misrouting into a structure leads to overfilling structure	F3	E3
WFD-03d-009	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Equipment malfunction	F0	E3
WFD-03d-010	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction	F0	E3
WFD-03d-013	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction	F2	E3
WFD-03d-014	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Equipment malfunction	F2	E3
WFD-03d-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Equipment malfunction (Ignition source assumed present)	F1	E3
WFD-03d-021	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	E3
WFD-03d-022	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	E3
WFD-03d-025	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F2	E3
WFD-03d-026	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F2	E3
WFD-03d-033	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Small transfer line leak	F0	E3
WFD-03d-034	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Small transfer line leak	F0	E3
WFD-03d-037	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Small transfer line leak	F2	E3
WFD-03d-038	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Small transfer line leak	F2	E3
WFD-03d-041	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Small transfer line leak	F0	E3
WFD-03d-044	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F0	E3
WFD-03d-045	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F0	E3
WFD-03d-048	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F2	E3
WFD-03d-049	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F2	E3

Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)

Hazardous Condition	Cause	Prob. Rank	Env. Rm.
WFD-03d-052 Release of tank waste to atmosphere from a spray leak from a failed transfer line or transfer line valve	Transfer line valve failures/misrouting	F3	E3
WFD-03d-057 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	E3
WFD-03d-058 Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	E3
WFD-03d-061 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F2	E3
WFD-03d-062 Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F2	E3
WFD-03d-065 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Valve closure	F0	E3
WFD-03d-066 Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Valve closure	F0	E3
WFD-03d-069 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Valve closure	F2	E3
WFD-03d-070 Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Valve closure	F2	E3
WFD-03d-073 Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Pump speed setting too high (Ignition source assumed present)	F1	E3
WFD-03d-077 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Pump speed setting too high	F0	E3
WFD-03d-081 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	E3
WFD-03d-082 Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	E3
WFD-03d-086 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3
WFD-03d-087 Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3
WFD-03d-090 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03d-091 Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03d-095 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3
WFD-03d-096 Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3
WFD-03d-099 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03d-100 Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03d-103 Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3
WFD-03d-104 Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3

Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)

Item ID*	Hazardous Conditions	Cause	Freq Rank	Env Rank
WFD-03d-107	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03d-108	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-03e-015	Release of tank waste to atmosphere from a spray leak due to misrouting	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste	F3	E3
WFD-03e-019	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line leak	F0	E3
WFD-03f-006	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F0	E3
WFD-03f-007	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F0	E3
WFD-03f-010	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F2	E3
WFD-03f-011	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F2	E3
WFD-04a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank (results in dry waste heel)	F2	E3
WFD-04a-014	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Incorrect caustic batch composition (Ignition source assumed present)	F1	E3
WFD-04a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Insufficient volume of caustic (Ignition source assumed present)	F1	E3
WFD-04a-023	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Excess volume of caustic (Ignition source assumed present)	F1	E3
WFD-04a-028	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing runaway chemical reactions	Excess volume of caustic leads to unexpected chemical reactions in tank waste	F1	E3
WFD-09a-066	Release of tank waste to the atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0	E3
WFD-09a-069	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	E3
WFD-09a-70	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	E3
WFD-09b-013	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0	E3
WFD-09c-052	Release of tank waste to atmosphere from a spray leak due to misrouting	Transfer line valve failures/misrouting that leads to line plugging and results in mechanical line failure	F3	E3
WFD-10a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	F3	E3
WFD-10a-002	Release of aerosolized waste from DST to atmosphere due to tank bump caused by addition of liquid to overheated concentration of heat-generating solids in sludge layer left unattended for an extended time	Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	F2	E3

**Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)**

Condition ID	Hazardous Condition	Cause	Freq Rank	Env Rank
WFD-12a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank	F2	E3
WFD-15b-039	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	E3
WFD-17a-095	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	E3
WFD-17c-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned transfer of waste	Equipment malfunction (Ignition source assumed present)	F1	E3
WFD-17c-052	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line valve failures/misrouting	F3	E3
WFD-17c-073	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Pump speed setting too high (Ignition source assumed present)	F1	E3
WFD-19a-005	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Surface crust prevents gas passage (Ignition source assumed present)	F1	E3
WFD-19a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Crust is semi-permeable (Ignition source assumed present)	F1	E3
WFD-19a-022	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	More gas retained in waste than theoretically expected (Ignition source assumed present)	F1	E3
WFD-19a-025	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Mixer pump operation too aggressive (Ignition source assumed present)	F1	E3
WFD-19a-028	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Waste mixing is more efficient than expected (Ignition source assumed present)	F1	E3
WFD-20a-014	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Incorrect caustic batch composition (Ignition source assumed present)	F1	E3
WFD-20a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Insufficient volume of caustic (Ignition source assumed present)	F1	E3
WFD-20a-023	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Excess volume of diluent (Ignition source assumed present)	F1	E3
WFD-22b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of solids	Higher than expected gas generation rate (Ignition source assumed present)	F1	E3
WFD-22b-007	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of waste	Solids trap greater than expected amount of gas during in tank settling (Ignition source assumed present)	F2	E3
WFD-23a-098	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1	E3
WFD-23c-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Equipment malfunction (Ignition source assumed present)	F1	E3
WFD-23c-058	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	E3
WFD-26a-012	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	F0	E3

**Table C-3. Hazardous Conditions With Potentially Significant Offsite Consequences (S3).
(7 Sheets)**

Item ID #	Hazardous Conditions	Cause	Freq Rank	Env Rank
WFD-26c-052	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Transfer line valve failures/misrouting	F3	E3
WFD-26c-073	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Pump speed setting too high (Ignition source assumed present)	F1	E3
WFD-26e-002	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste and produces a leak	F3	E3
WFD-29a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank	F2	E3
WFD-29a-032	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1	E3
WFD-31b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of waste	Higher than expected gas generation rate (Ignition source assumed present)	F1	E3
WFD-32a-094	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	E3
WFD-35d-007	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting results in the structure over filling with tank waste and produces a leak	F3	E3
WFD-35d-052	Release of tank waste to soil and atmosphere from a spray leak of waste	Transfer line valve failures/misrouting	F3	E3
WFD-35d-082	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	E3
WFD-35d-087	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	F2	E3
WFD-35d-090	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	E3
WFD-35d-091	Release of tank waste to soil from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	F2	E3
WFD-35f-015	Release of tank waste to soil and atmosphere from a spray leak of waste	Misrouting caused by human error or mechanical malfunction that results in the structure over filling and produces a leak	F3	E3
WFD-40b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Higher than expected gas generation rate (Ignition source assumed present)	F1	E3
WFD-41a-091	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	E3
WFD-41d-022	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	E3
WFD-41d-081	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	E3
WFD-41d-087	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	E3

This page intentionally left blank.

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Item ID	Hazardous Condition	Cause	Freq Rank	Env Rank
WFD-01b-001	Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes a tank bump	Extended mixer pump operation adds significant heat to tank waste and results in bump after mixer pump shutdown	F1	E1
WFD-01b-002	Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes runaway chemical reactions	Extended mixer pump operation increased heat load in tank	F1	E1
WFD-01b-003	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Chemical reactions	F1	E1
WFD-01b-004	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions	Chemical reactions created as a result of increasing waste temperature through mixer pump operation	F1	E1
WFD-01b-005	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	F1	E1
WFD-01b-006	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow to remove heat generated by mixer pump operation	F1	E1
WFD-01b-007	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	F1	E1
WFD-01b-008	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system results in head build up from operating mixer pump	F1	E1
WFD-01b-009	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow	F1	E1
WFD-01b-010	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow to remove head generated by mixer pump operator	F1	E1
WFD-01b-011	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system	F1	E1
WFD-01b-012	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system results in build up from operating mixer pump	F1	E1
WFD-01b-013	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Waste solids congregate in dead zones	F1	E1
WFD-01b-014	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions	Waste solids congregate in dead zones resulting in head build up	F1	E1
WFD-02c-003	Release of aerosolized waste from DST to atmosphere due to waste heating which causes a tank bump	Insulating factor due to fluffing greater than expected	F1	E1
WFD-02c-004	Release of aerosolized waste from DST to atmosphere due to waste heating which causes runaway chemical reactions	Insulating factor due to fluffing greater than expected resulting in increased tank waste temperatures	F1	E1
WFD-03a-074	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction during diluent addition leads to overfilling of waste tank	F1	E1
WFD-03a-076	Release of tank waste to the soil due to a pool leak due to a misrouting	Procedural/human error during diluent addition leads to overfilling of waste tank	F1	E1

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Hazardous Condition	Cause	Imp. Rank	Env. Rank
WFD-05b-010 Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate annulus ventilation flow to remove heat generated by mixer pump operation	F1	E1
WFD-17a-074 Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction during diluent addition leads to overfilling of waste tank	F1	E1
WFD-17a-076 Release of tank waste to the soil due to a pool leak due to a misrouting	Procedural/human error during diluent addition leads to overfilling of waste tank	F1	E1
WFD-19b-012 Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system results in heat build up from operating mixer pump	F1	E1
WFD-28b-005 Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	F1	E1
WFD-28b-007 Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	F1	E1
WFD-28b-009 Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow	F1	E1
WFD-28b-011 Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system	F1	E1
WFD-01a-007 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Surface crust prevents gas passage leading to GRE pressurizing headspace (no ignition source assumed present)	F2	E2
WFD-01a-019 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	More gas retained in waste than theoretically expected resulting in GRE pressurization headspace (no ignition source assumed present)	F2	E2
WFD-01a-027 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mixer pump operation too aggressive resulting in GRE pressurizing headspace (no ignition source assumed present)	F2	E2
WFD-01a-030 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Waste mixing is more efficient than expected resulting in more gas evolution than expected (no ignition source assume present)	F2	E2
WFD-02a-006 Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	F3	E2
WFD-02a-007 Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	F3	E2
WFD-02a-010 Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	F3	E2
WFD-02b-006 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Higher than expected gas generation rate results in GRE leading to headspace pressurization (no ignition source assumed present)	F1	E2
WFD-02b-009 Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Solids trap greater than expected amount of gas during in tank settling resulting in GRE pressurizing headspace (no ignition source present)	F2	E2
WFD-03a-008 Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line	F3	E2

**Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)**

Item ID	Hazardous Conditions	Cause	Freq Rank	Env Rank
WFD-03a-009	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical failure of transfer line	F3	E2
WFD-03a-013	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	F3	E2
WFD-03a-014	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-017	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F3	E2
WFD-03a-018	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-022	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F3	E2
WFD-03a-023	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	F3	E2
WFD-03a-026	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F3	E2
WFD-03a-027	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	F3	E2
WFD-03a-031	Release of tank waste to atmosphere from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-032	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-035	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F3	E2
WFD-03a-036	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-040	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Restriction in diluent line	F3	E2
WFD-03a-041	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-044	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Restriction in diluent line	F3	E2
WFD-03a-045	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-053	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F3	E2
WFD-03a-067	Release of tank waste to soil from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F3	E2
WFD-03a-068	Release of tank waste to soil from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	F3	E2

**Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)**

Item ID	Hazardous Condition	Cause	Freq. Rank	Env. Rank
WFD-03a-071	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	E2
WFD-03a-072	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03a-086	Release of Tank Waste to the soil from the Diluent Addition system due to failure of valves and pressure switches in the diluent addition system flush line while the transfer pump is operating	Human error	F3	E2
WFD-03a-087	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing transfer flush from AN, AY, or AZ Farms to AW Farm	F3	E2
WFD-03a-092	Release of tank waste to soil from an underground pool leak of waste from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	E2
WFD-03a-093	Release of tank waste to soil from an aboveground pool leak of waste from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	F3	E2
WFD-03a-096	Release of tank waste to soil from an underground pool leak of waste from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	E2
WFD-03a-097	Release of tank waste to soil from an aboveground pool leak of waste from a failed (new) transfer line	Mislabeled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	F3	E2
WFD-03a-100	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mislabeled chemical used for supply of diluent, human error leads to chemical reactions resulting in GRE (no ignition source assumed present)	F1	E2
WFD-03a-101	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an incorrect diluent solution, leading to waste heating which causes a tank bump	Mislabeled chemical used for supply of diluent, human error	F1	E2
WFD-03a-103	Release of toxic vapors from diluent system due to damage from unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	E2
WFD-03c-012	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F3	E2
WFD-03c-013	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03c-016	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F3	E2
WFD-03c-017	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	F3	E2
WFD-03d-006	Release of tank waste to soil from a pool leak of waste	Misrouting	F3	E2
WFD-03d-011	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	F3	E2
WFD-03d-012	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	F3	E2
WFD-03d-015	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction	F3	E2
WFD-03d-016	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	F3	E2

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Item ID#	Hazardous Condition	Cause	Freq Rank	Env Rank
WFD-03d-019	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Equipment malfunction leads to low flow transfer allowing more gas buildup time in tank leading to GRE (no ignition source assumed present)	F1	E2
WFD-03d-023	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F3	E2
WFD-03d-024	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	F3	E2
WFD-03d-027	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F3	E2
WFD-03d-028	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	F3	E2
WFD-03d-035	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Small transfer line leak	F3	E2
WFD-03d-036	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	F3	E2
WFD-03d-039	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Small transfer line leak	F3	E2
WFD-03d-040	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	F3	E2
WFD-03d-042	Release of tank waste to soil from a pool leak from a failed transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	F3	E2
WFD-03d-046	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F3	E2
WFD-03d-047	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Transfer line valve failures/misrouting causes line to plug that results in mechanical failure of the transfer line	F3	E2
WFD-03d-050	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F3	E2
WFD-03d-051	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug that results in mechanical failure of the transfer line	F3	E2
WFD-03d-053	Release of tank waste to soil from a pool leak of waste	Transfer line valve failures/misrouting	F3	E2
WFD-03d-059	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F3	E2
WFD-03d-060	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump and mechanical failure of the transfer line	F3	E2
WFD-03d-063	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F3	E2
WFD-03d-064	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump and mechanical failure of the transfer line	F3	E2
WFD-03d-067	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Valve closure	F3	E2
WFD-03d-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Valve closure leads to mechanical failure of the transfer line	F3	E2
WFD-03d-071	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Valve closure	F3	E2
WFD-03d-072	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Valve closure leads to mechanical failure of the transfer line	F3	E2

**Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)**

Item ID	Hazardous Condition	Cause	Freq Rank	Env Rank
WFD-03d-075	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Pump speed setting too high results in excessively fast transfer leading to a rapid decrease in hydrostatic head that creates GRE (no ignition source assumed present)	F2	E2
WFD-03d-079	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Pump speed setting too high	F3	E2
WFD-03d-080	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Pump speed setting too high causes mechanical failure of the transfer line due to increased erosion of the transfer line	F3	E2
WFD-03d-083	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Pump speed setting too high	F3	E2
WFD-03d-084	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical failure of the transfer line due to increased erosion of the transfer line	F3	E2
WFD-03d-088	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-089	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line	F3	E2
WFD-03d-092	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-093	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line	F3	E2
WFD-03d-097	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-098	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes the line to plug and results mechanical failure of the transfer line	F3	E2
WFD-03d-101	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-102	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes the line to plug and results mechanical failure of the transfer line	F3	E2
WFD-03d-105	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-106	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical line failure of the transfer line	F3	E2
WFD-03d-109	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	E2
WFD-03d-110	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical line failure of the transfer line	F3	E2
WFD-03e-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage leads to overfilling of waste tank	F2	E2
WFD-03e-014	Release of tank waste to soil from a pool leak of waste	Misrouting: Human error or mechanical malfunction	F3	E2
WFD-03e-018	Release of tank waste to soil from a pool leak from a failed transfer line	Transfer line leak	F3	E2

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Item ID	Hazardous Condition	Causes	Freq Rank	Env Rank
WFD-03e-021	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of simultaneous transfer or flush, inleakage, and an extended transfer duration causes overfilling intermediate waste feed tank	F3	E2
WFD-03f-001	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F1	E2
WFD-03f-008	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	E2
WFD-03f-009	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature (e.g., phosphate ring)	F3	E2
WFD-03f-012	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	E2
WFD-03f-013	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature(e.g., phosphate ring)	F3	E2
WFD-04a-003	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling designation tank	F3	E2
WFD-04a-004	Release of diluent to soil and/or atmosphere from a leak from the diluent addition system	Equipment malfunction: Pump failure causes diluent line to plug and freeze which causes the diluent line to break	F3	E2
WFD-04a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation results in overfilling waste feed tank	F3	E2
WFD-04a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	F3	E2
WFD-04a-016	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Incorrect caustic batch composition results in chemical reactions leading to a GRE (no ignition source assumed present)	F1	E2
WFD-04a-019	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Insufficient volume of caustic results in chemical reactions leading to a GRE (no ignition source assumed present)	F1	E2
WFD-04a-025	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Excess volume of caustic results in chemical reactions leading to a GRE (no ignition source assumed present)	F1	E2
WFD-04a-027	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an excess concentration of diluent, leading to waste heating which causes a tank bump	Excess volume of caustic results in chemical reactions leading to tank bump	F1	E2
WFD-04a-029	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farms to AW Farm	F3	E2
WFD-06a-027	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing a tank bump	Excess volume of caustic results in chemical reactions leading to a tank bump	F1	E2
WFD-06a-035	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mislabeled chemical used for supply of diluent, human error leads to chemical reactions resulting in GRE (no ignition source assumed present)	F1	E2

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Item #	Hazardous Condition	Cause	Freq. Rank	Env. Rank
WFD-09a-018	Release of tank waste to soil from an aboveground pool leak from a failed transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	F3	E2
WFD-09a-031	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	F3	E2
WFD-09a-050	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	F3	E2
WFD-09a-072	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	E2
WFD-09b-018	Release of tank waste to soil from an underground pool leak from a failed transfer line	Transfer piping at lower temperature than supernate	F3	E2
WFD-09c-006	Release of tank waste to soil from a pool leak of waste due to misrouting	Misrouting	F3	E2
WFD-09c-109	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	E2
WFD-12a-027	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Excess volume of caustic creates chemical reactions leading to a GRE (no ignition source assumed present)	F1	E2
WFD-15e-012	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	E2
WFD-17a-022	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F3	E2
WFD-17a-031	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	F3	E2
WFD-17a-067	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F3	E2
WFD-17a-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	E2
WFD-17a-071	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	E2
WFD-17a-072	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	E2
WFD-17a-092	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	E2
WFD-17a-096	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	E2
WFD-17a-097	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	F3	E2
WFD-17a-103	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	E2
WFD-17c-006	Release of tank waste to soil from a pool leak of waste	Misrouting	F3	E2
WFD-17c-011	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	F3	E2
WFD-17c-042	Release of tank waste to soil from a pool leak from a failed transfer line	Small transfer line leak	F3	E2
WFD-17c-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Valve closure causes mechanical line failure	F3	E2

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

Ident.	Hazardous Condition	Consequence	Freq. Rank	Env. Rank
WFD-17e-005	Release of tank waste to soil from a pool leak from a failed transfer line	Transfer line leak	F3	E2
WFD-17f-001	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increases that result in tank bump	F1	E2
WFD-17f-008	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	E2
WFD-20a-008	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling destination waste tank	F3	E2
WFD-20a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling waste tank	F3	E2
WFD-20a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	F3	E2
WFD-23a-032	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	F3	E2
WFD-23a-063	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition causes line to plug and results in mechanical line failure	F3	E2
WFD-23a-093	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	F3	E2
WFD-23c-006	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting	F3	E2
WFD-23c-024	Release of tank waste to atmosphere from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug and results in mechanical line failure	F3	E2
WFD-23c-051	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug and results in mechanical line failure	F3	E2
WFD-23c-083	Release of tank waste to soil and atmosphere from an underground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of the transfer line walls	F3	E2
WFD-23f-001	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the contractor tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increase that result in tank bump	F1	E2
WFD-26a-050	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	F3	E2
WFD-26a-086	Release of tank waste to soil from a pool leak due to mechanical failures and misrouting	Human error; failure of flush line valves AND pressure switches from caustic additions system	F3	E2
WFD-26b-018	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F3	E2
WFD-26c-047	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug and results in mechanical line failure	F3	E2
WFD-26c-060	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump and results in mechanical line failure	F3	E2

Table C-4. Hazardous Conditions With Potentially Significant Onsite Consequences (S2).
(10 Sheets)

ID#(ID#)	Hazardous Condition	Cause	Freq. Rank	Env. Rank
WFD-26c-083	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Pump speed setting too high	F3	E2
WFD-26c-084	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of transfer line walls	F3	E2
WFD-26c-088	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	E2
WFD-26c-089	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected causes mechanical line failure due to increased erosion of transfer line walls	F3	E2
WFD-29a-004	Release of tank waste to soil or atmosphere from a spray or pool leak from a diluent addition system	Equipment malfunction: Pump failure, diluent line plug/freeze, diluent line break	F3	E2
WFD-29a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling of waste tank	F3	E2
WFD-29a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling of waste tank	F3	E2
WFD-32a-035	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F3	E2
WFD-32a-062	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F3	E2
WFD-32c-042	Release of tank waste to soil from a pool leak of waste	Small transfer line leak	F3	E2
WFD-32e-001	Release of tank waste to atmosphere from a pool leak due to mechanical failures and misrouting	Misrouting: Human error or mechanical malfunction	F3	E2
WFD-32e-005	Release of tank waste to soil from a pool leak of waste	Transfer line leak	F3	E2
WFD-35a-009	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical line failure	F3	E2
WFD-35a-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	E2
WFD-35a-103	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	E2
WFD-35e-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage leads to overfilling of waste tank	F2	E2
WFD-41a-014	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	F3	E2
WFD-03a-004	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Plugging/freezing of diluent line	F3	E3
WFD-03a-005	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Plugging/freezing of diluent line causes mechanical failure of transfer line	F3	E3

Table C-5. Hazardous Conditions With Potentially Significant Worker Consequences (S1).

Item ID #	Hazardous Conditions	Cause	Freq Rank	EDV Rank
WFD-42a-001	Personnel exposure to waste that is present in abovegrade portions of the diluent system and diluent transfer lines. No release of waste or diluent is assumed	Diluent system pump failure allows waste to gravity flow into diluent system abovegrade piping	F3	E0
WFD-01a-006	Personnel exposure to toxic vapor due to tank overpressurization	Surface crust prevents gas passage	F3	E1
WFD-01a-018	Personnel exposure to toxic vapor due to tank overpressurization	More gas retained in waste than theoretically expected	F3	E1
WFD-01a-026	Personnel exposure to toxic vapor due to tank overpressurization	Mixer pump operation too aggressive	F3	E1
WFD-01a-029	Personnel exposure to toxic vapor due to tank overpressurization	Waste mixing is more efficient than expected	F3	E1
WFD-03a-104	Personnel injury due to unexpected chemical reactions damaging diluent system	Mislabeled chemical used for supply of diluent, human error	F3	E1
WFD-03d-074	Personnel exposure to toxic vapor due to tank overpressurization	Pump speed setting too high	F3	E1
WFD-04a-030	Release of toxic chemicals to soil surface due to leak from caustic addition system	Siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farm to AW Farm	F3	E1
WFD-39a-001	Personnel exposure to toxic aerosol due to loss of confinement during sampling	N/A	F3	E1

This page intentionally left blank.

Table C-6. Hazardous Conditions With Potential Occupational (OCC) Safety Consequences.

Item ID #	Hazardous Conditions	Cause
WFD-01a-006	Personnel exposure to toxic vapor due to tank overpressurization	Surface crust prevents gas passage
WFD-01a-018	Personnel exposure to toxic vapor due to tank overpressurization	More gas retained in waste than theoretically expected
WFD-01a-026	Personnel exposure to toxic vapor due to tank overpressurization	Mixer pump operation too aggressive
WFD-01a-029	Personnel exposure to toxic vapor due to tank overpressurization	Waste mixing is more efficient than expected
WFD-03a-104	Personnel injury due to unexpected chemical reactions damaging diluent system	Mislabeled chemical used for supply of diluent, human error
WFD-03d-074	Personnel exposure to toxic vapor due to tank overpressurization	Pump speed setting too high
WFD-39a-001	Personnel exposure to toxic aerosol due to loss of confinement during sampling	N/A
WFD-42a-001	Personnel exposure to waste that is present in abovegrade portions of the diluent system and diluent transfer lines. No release of waste or diluent is assumed	Diluent system pump failure allows waste to gravity flow into diluent system abovegrade piping

This page intentionally left blank.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Description	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	
04X WFD-01a-005	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Surface crust prevents gas passage (ignition source assumed present)									
04X WFD-01a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Crust is semi-permeable (ignition source assumed present)									

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

C7	ID	Description	Control Level			S3	F1
			SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys		
04X	WFD-01a-022	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	More gas retained in waste than theoretically expected (Ignition source assumed present)	SC: AWF Tank Struct	AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

S&C	Facility/Location	Description	Initial Consequence	Final Consequence	Safety System Control		Control Rating	Fragile Point Rating
					SSC	TSR		
04X	WFD-01a-025	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Mixer pump operation too aggressive (Ignition source assumed present)	SC: DST/AWF Vent SC: DST Strict Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Conc Rank	Freq Rank
04X	WFD-01a-028	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Waste mixing is more efficient than expected (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X	WFD-02b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Higher than expected gas generation rate (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct SC: Primary Tank Leak Detect Sys	LCO: DST and AWF Tank Vent Sys LCO: Primary Tank Leak Detect Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Description	SSC	TSR	S3		S2		
				F1	F2	F3	F4	
04X	WFD-02b-007	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of degassed waste	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Syss AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	
04X	WFD-03a-098	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	SC: DST/AWF Vent SC: Primary Tank Leak Detect Syss	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Syss LCO: Primary Tank Leak Detect Syss AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	
04X	WFD-03a-100	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Syss LCO: Primary Tank Leak Detect Syss AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref ID	Description	Process	Process SSC	Process	Process SSC	Process	Process SSC	Process	Process SSC
04X WFD-03d-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Equipment malfunction (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X WFD-03d-073	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Pump speed setting too high (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: Primary Tank Leak Detect Sys (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: HEPA Filter Cntrls (Source Term)	AC: HEPA Filter Cntrls (Source Term)	S3	F1
04X WFD-04a-014	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Incorrect caustic batch composition (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

WFD-04a-016		Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Incorrect caustic batch composition results in chemical reactions leading to a GRE (no ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S2	F1
WFD-04a-017		Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Insufficient volume of caustic (Ignition source assumed present)	SC: DST/AWF Vent	SC: AWF Tank Struct	LCO: Primary Tank Leak Detect Sys	AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
WFD-04a-019		Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Insufficient volume of caustic results in chemical reactions leading to a GRE (no ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

RPP Act.	Ref ID	Hazard Coding	Consequence	SSC	Measure	TSR	Control Level	
04X	WFD-04a-023	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Excess volume of caustic (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.
04X	WFD-04a-025	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Excess volume of caustic results in chemical reactions leading to a GRE (no ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.
04X	WFD-06a-035	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mislabeled chemical used for supply of diluent, human error leads to chemical reactions resulting in GRE (no ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Hazard Condition	Pre-SSC	Post-SSC	Procedures		AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.
				SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct		
04X	WFD-12a-027	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Excess volume of caustic creates chemical reactions leading to a GRE (no ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	AC: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)
04X	WFD-17c-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned transfer of waste	Equipment malfunction (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	AC: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)
04X	WFD-17c-073	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Pump speed setting too high (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	AC: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Ac	Ident ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Cont Mcro	Cont Rank	Cont Freq
04X	WFD-19a-005	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Surface crust prevents gas passage (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls(Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X	WFD-19a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Crust is semi-permeable (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls(Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X	WFD-19a-022	Release of aerosolized waste to atmospheric due to ignition of flammable gas in the head space of DST during planned mixer pump operation	More gas retained in waste than theoretically expected (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls(Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

04X		WFD-19a-025	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Mixer pump operation too aggressive (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X		WFD-19a-028	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Waste mixing is more efficient than expected (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X		WFD-20a-014	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Incorrect caustic batch composition (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct	LCO: DST and AWF Tank Vent Sys	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

					S3	F1
04X	WFD-20a-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Insufficient volume of caustic (ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls
04X	WFD-20a-023	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of shimming chemicals	Excess volume of diluent (ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls
04X	WFD-22b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of solids	Higher than expected gas generation rate (ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
04X	WFD-22b-007	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of waste	Solids trap greater than expected amount of gas during in tank settling (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F2
04X	WFD-23a-098	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1
04X	WFD-23c-017	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Equipment malfunction (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip AC: Excavation Cntrls	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row Num ber	Item ID	Potential Consequence	S3 - SCS	M/S	SC: DST/AWF Vent	LCO: DST and AWF Tank Vent Syss	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Control Memo	SC: DST Struct Struct	SC: AWF Tank Struct	AC: Flammability Cntrls (Facility Group)	AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls	AC: Process Instrument/Measure/Test Equip	AC: Excavation Cntrls	SC: DST Struct Struct	SC: AWF Tank Struct	AC: Flammability Cntrls (Facility Group)	AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls	AC: Process Instrument/Measure/Test Equip	AC: Excavation Cntrls	SC: DST Struct Struct	SC: AWF Tank Struct	AC: Flammability Cntrls (Facility Group)	AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls	AC: Process Instrument/Measure/Test Equip	AC: Excavation Cntrls			
04X	WFD-26c-073	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer	Pump speed setting too high (Ignition source assumed present)																										
04X	WFD-29a-032	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of thinning chemicals	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)																										
04X	WFD-31b-004	Release of aerosolized waste to atmospheric due to ignition of flammable gas in the head space of DST during planned settling of waste	Higher than expected gas generation rate (Ignition source assumed present)																										

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

RPP Acc	Ref ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Per TSR	Mit TSR	Conc Rank	F1
04X	WFD-40b-004	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Higher than expected gas generation rate (Ignition source assumed present)	SC: DST/AWF Vent	SC: DST Struct SC: AWF Tank Struct	LCO: DST and AWF Tank Vent Sys AC: Flammability Cntrls (Facility Group) AC: Ign Cntrls (Flam Gas) AC: Flam Gas Mon Cntrls AC: Trans Cntrls AC: Process Instrument/Measure/Test Equip	AC: Emergency Prep (Fire and Waste Leak) AC: HEPA Filter Cntrls (Source Term)	Controls based on accident analysis (Flammable Gas Deflagrations - DST) and WFD control decision process.	S3
06X	WFD-01a-007	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Surface crust prevents gas passage leading to GRE pressurizing headspace (no ignition source assumed present)	None required	SS: Vent Stack CAM Intrlk Sys	None required	LCO: Vent Stack CAM Intrlk Sys AC: HEPA Filter Cntrls (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2
06X	WFD-01a-019	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	More gas retained in waste than theoretically expected resulting in GRE pressurization headspace (no ignition source assumed present)	None required	SS: Vent Stack CAM Intrlk Sys	None required	LCO: Vent Stack CAM Intrlk Sys AC: HEPA Filter Cntrls (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2
06X	WFD-01a-027	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mixer pump operation too aggressive resulting in GRE pressurizing headspace (no ignition source assumed present)	None required	SS: Vent Stack CAM Intrlk Sys	None required	LCO: Vent Stack CAM Intrlk Sys AC: HEPA Filter Cntrls (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
06X	WFD-01a-030	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Waste mixing is more efficient than expected resulting in more gas evolution than expected (no ignition source assume present)	None required	SS: Vent Stack CAM Intrlk Syss	None required	LCO: Vent Stack CAM Intrlk Syss AC: HEPA Filter Critrs (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2	F2
06X	WFD-02b-006	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Higher than expected gas generation rate results in GRE leading to headspace pressurization (no ignition source assumed present)	None required	SS: Vent Stack CAM Intrlk Syss	None required	LCO: Vent Stack CAM Intrlk Syss AC: HEPA Filter Critrs (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2	F1
06X	WFD-02b-009	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Solids trap greater than expected amount of gas during in tank settling resulting in GRE pressurizing headspace (no ignition source present)	None required	SS: Vent Stack CAM Intrlk Syss	None required	LCO: Vent Stack CAM Intrlk Syss AC: HEPA Filter Critrs (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2	F2
06X	WFD-03d-019	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Equipment malfunction leads to low flow transfer allowing more gas buildup time in tank leading to GRE (no ignition source assumed present)	None required	SS: Vent Stack CAM Intrlk Syss	None required	LCO: Vent Stack CAM Intrlk Syss AC: HEPA Filter Critrs (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
06X	WFD-03d-075	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Pump speed setting too high results in excessively fast transfer leading to a rapid decrease in hydrostatic head that creates GRE (no ignition source assumed present)	None required	SS: Vent Stack CAM Intlk Sys	None required	LCO: Vent Stack CAM Intlk Sys AC: HEPA Filter Cntrls (Efficiency, Source Term)	Stack CAM provides mitigation for long term releases. Controls based on accident analysis (HEPA Filter Failure - Exposure to High Temperature or Pressure).	S2	F2
09X	WFD-01b-002	Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes runaway chemical reactions	Extended mixer pump operation increased heat load in tank	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1
09X	WFD-01b-004	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions	Chemical reactions created as a result of increasing waste temperature through mixer pump operation	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1
09X	WFD-01b-006	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow to remove heat generated by mixer pump operation	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

09X	WFD-01b-008	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system results in head build up from operating mixer pump	SS: Temp Mon Syss (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1	
09X	WFD-01b-010	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow to remove head generated by mixer pump operator	SS: Temp Mon Syss (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1	
09X	WFD-01b-012	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system results in build up from operating mixer pump	SS: Temp Mon Syss (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1	
09X	WFD-01b-014	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions	Waste solids congregate in dead zones resulting in head build up	SS: Temp Mon Syss (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1	

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Coas Rank	Freq Rank
09X	WFD-02c-004	Release of aerosolized waste from DST to atmosphere due to waste heating which causes runaway chemical reactions	Insulating factor due to fluffing greater than expected resulting in increased tank waste temperatures	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1
09X	WFD-04a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank results in dry waste heel)	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S3	F2
09X	WFD-04a-028	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing runaway chemical reactions	Excess volume of caustic leads to unexpected chemical reactions in tank waste	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S3	F1
09X	WFD-05b-010	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate annulus ventilation flow to remove heat generated by mixer pump operation	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Pev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
09X	WFD-10a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S3	F3
09X	WFD-12a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S3	F2
09X	WFD-19b-012	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system results in heat build up from operating mixer pump	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S2	F1
09X	WFD-29a-001	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank	SS: Temp Mon Sys (Organic Salt-Nitrate)	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Ign Cntrls (Organic Salt-Nitrate) AC: Trans Cntrls (Organic Salt-Nitrate) AC: Process Instrument/Measure/Test Equip (Organic Salt-Nitrate)	AC: Emergency Prep (Fire)	Controls based on accident analysis (Organic Salt-Nitrate Reaction)	S3	F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row ID	Event ID	Hazardous Conditions	Consequence	Class	Control Measures	Other Risk	Final Risk	
15X	WFD-03a-085	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Human error; failure of flush line valves AND pressure switches results in reverse flow of waste into diluent system	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Valve Pits, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys LCO: 204-AR Backflow Prevention Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls AC: Emergency Prep (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3 F3
15X	WFD-03a-087	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing transfer flush from AN, AY, or AZ Farms to AW Farm	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility)	None required	None required	LCO: Service Water Pressure Detection Systems	S2 F3
15X	WFD-03d-052	Release of tank waste to atmosphere from a spray leak from a failed transfer line or transfer line valve	Transfer line valve failures/misrouting	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Valve Pits, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys LCO: 204-AR Backflow Prev Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls AC: Emergency Prep (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3 F3
15X	WFD-04a-029	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farms to AW Farm	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility)	None required	None required	LCO: Service Water Pressure Detection Systems	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
15X	WFD-09c-052	Release of tank waste to atmosphere from a spray leak due to misrouting	Transfer line valve failures/misrouting that leads to line plugging and results in mechanical line failure	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Valve Pits, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys LCO: 204-AR Backflow Prev Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls AC: Emergency Prep (Waste Leak)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Vent Stack CAM Intrik Sys AC: Trans Cntrls (Spray Leak) AC: HEPA Filter Cntrls AC: Trans Sys Cover Removal Cntrls AC: Emergency Prep (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3	F3
15X	WFD-17c-052	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line valve failures/misrouting	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Valve Pits, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detection Sys LCO: 204-AR Backflow Prev Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls AC: Emergency Prep (Waste Leak)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Vent Stack CAM Intrik Sys AC: Trans Cntrls (Spray Leak) AC: HEPA Filter Cntrls AC: Trans Sys Cover Removal Cntrls AC: Emergency Prep (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
15X	WFD-26c-052	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Transfer line valve failures/misrouting	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Pits, Diversion Boxes, Valve Pts, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detection Sys LCO: 204-AR Backflow Prev Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Vent Stack CAM Intrik Sys LCO: Trans Cntrls (Spray Leak) AC: HEPA Filter Cntrls AC: Trans Sys Cover Removal Cntrls AC: Emergency Prep (Waste Leak) LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Vent Stack CAM Intrik Sys AC: Transfer Controls (Spray Leak) AC: HEPA Filter Controls AC: Transfer System Cover Removal Controls AC: Emergency Preparedness (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3	F3
15X	WFD-29a-004	Release of tank waste to soil or atmosphere from a spray or pool leak from a diluent addition system	Equipment malfunction: Pump failure, diluent line plug/freeze, diluent line break	SC: Pressure Switch Intricks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility)	None required	None required	LCO: Service Water Pressure Detection Systems	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line) and WFD control decision process.	S2	F3
15X	WFD-35d-052	Release of tank waste to soil and atmosphere from a spray leak of waste	Transfer line valve failures/misrouting	SC: Pressure Switch Intriks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility) SS: Backflow Prev Devices	SC: Trans Sys Covers SC: Abovegrade Pits, Diversion Boxes, Valve Pts, and COBs (Physical Integrity) SC: Vent Stack CAM Intrik Sys SC: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys LCO: 204-AR Backflow Prev Sys AC: Trans Cntrls (Spray Leaks) AC: Encas Seal Loop Cntrls AC: Trans Pump Admin Lock Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Vent Stack CAM Intrik Sys AC: Trans Cntrls (Spray Leak) AC: HEPA Filter Cntrls AC: Trans Sys Cover Removal Cntrls AC: Emergency Prep (Waste Leak)	Controls based on accident analysis (Spray Leak in Structure or from Overground Waste Transfer Line).	S3	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Description	Control	Required	Control	Required	Control	Required
16X WFD-02a-005	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	None required	None required	None required	No controls required based on low accident frequency.	F0
16X WFD-02a-008	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	None required	None required	None required	No controls required based on low accident frequency.	F2
16X WFD-02a-009	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	None required	None required	None required	No controls required based on low accident frequency.	S3
16X WFD-03a-002	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Plugging/freezing of diluent line	None required	None required	None required	No controls required based on low accident frequency.	F0
16X WFD-03a-003	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Plugging/freezing of diluent line	None required	None required	None required	No controls required based on low accident frequency.	S3
16X WFD-03a-006	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Plugging/freezing of diluent line	None required	None required	None required	No controls required based on low accident frequency.	F2
16X WFD-03a-007	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Plugging/freezing of diluent line	None required	None required	None required	No controls required based on low accident frequency.	S3
16X WFD-03a-011	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

16X	WFD-03a-012	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03a-015	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03a-016	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03a-020	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Procedural/hu man error in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03a-021	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Procedural/hu man error in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03a-024	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Procedural/hu man error in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03a-025	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Procedural/hu man error in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03a-029	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	None required	None required	None required	No controls required based on low accident frequency.	S3 F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Cause	Prev. SSC	Mit. SSC	Prev. TSR	Mit. TSR	Control Memo	Con. Rank	Freq. Rank
16X	WFD-03a-030	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03a-033	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03a-034	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03a-038	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Restriction in diluent line	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03a-039	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Restriction in diluent line	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03a-042	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Restriction in diluent line	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03a-043	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Restriction in diluent line	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03a-065	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Description	Control Method	Frequency		Control Method	Frequency	
			Low	High		Low	High
16X WFD-03a-066	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-069	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-070	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-090	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Mislabelled chemical used for supply of diluent, human error	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-091	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabelled chemical used for supply of diluent, human error	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-094	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabelled chemical used for supply of diluent, human error	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03a-095	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabelled chemical used for supply of diluent, human error	None required	None required	None required	None required	No controls required based on low accident frequency.
16X WFD-03c-010	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	None required	None required	None required	None required	No controls required based on low accident frequency.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

16X	WFD-03c-011	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03c-014	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03c-015	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03d-009	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Equipment malfunction	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03d-010	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-03d-013	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03d-014	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Equipment malfunction	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-03d-021	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3 F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Metric	Cont. Rank	Freq. Rank
16X	WFD-03d-022	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-025	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-026	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-033	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Small transfer line leak	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-034	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Small transfer line leak	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-037	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Small transfer line leak	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-038	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Small transfer line leak	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-041	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Small transfer line leak	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
16X	WFD-03d-044	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-045	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-048	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-049	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-057	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-058	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-061	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-062	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Line ID	Description	SSC	TSR	Control Required	Consequence
16X WFD-03d-065	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Valve closure	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-066	Release of tank waste to atmosphere from an underground spray leak from a failed (existing) transfer line	Valve closure	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-069	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Valve closure	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-070	Release of tank waste to atmosphere from an underground spray leak from a failed (new) transfer line	Valve closure	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-077	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Pump speed setting too high	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-081	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-082	Release of tank waste to atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	None required	None required	No controls required based on low accident frequency.
16X WFD-03d-086	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	No controls required based on low accident frequency.

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Consequence Rank	Freq. Rank
16X	WFD-03d-087	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-090	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-091	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-095	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-096	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-03d-099	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-100	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-03d-103	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3	F0

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Facility ID	Hazardous Condition	Control Measure	Risk		Control Memo	EPA Risk Rank
				Assess.	Exposure		
16X	WFD-03d-104	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	F0
16X	WFD-03d-107	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	S3
16X	WFD-03d-108	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	No controls required based on low accident frequency.	F2
16X	WFD-03e-019	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line leak	None required	None required	No controls required based on low accident frequency.	S3
16X	WFD-03f-006	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	None required	No controls required based on low accident frequency.	F0
16X	WFD-03f-007	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	None required	No controls required based on low accident frequency.	S3
16X	WFD-03f-010	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	None required	No controls required based on low accident frequency.	F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rcp Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
16X	WFD-03F-011	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-09a-066	Release of tank waste to the atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-09a-069	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-09a-70	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2
16X	WFD-09b-013	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-15b-039	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
16X	WFD-17a-095	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Line ID	Event ID	Potential Consequence	SSC	TSR	SSC	TSR	SSC	TSR
16X	WFD-23c-058	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-26a-012	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-32a-094	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-35d-082	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-35d-090	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	None required	None required	None required	No controls required based on low accident frequency.	S3 F2
16X	WFD-41a-091	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-41d-022	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	None required	None required	None required	No controls required based on low accident frequency.	S3 F0
16X	WFD-41d-081	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	None required	None required	None required	No controls required based on low accident frequency.	S3 F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Cont. Memo	Cont. Rank	Freq. Rank
16X	WFD-41d-087	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	None required	None required	None required	None required	No controls required based on low accident frequency.	S3	F0
17X	WFD-04a-004	Release of diluent to soil and/or atmosphere from a leak from the diluent addition system	Equipment malfunction: Pump failure causes diluent line to plug and freeze which causes the diluent line to break	SS: Pressure Switch Interlocks or Alarms (Service Water Lines, except 204-AR Waste Unloading Facility)	None required	LCO: Service Water Pressure Detect Sys	AC: Caustic Trans Cntrls	Controls based on accident analysis (Caustic Spray Leak) and WFD control decision process.	S2	F3
18A X	WFD-01b-001	Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes a tank bump	Extended mixer pump operation adds significant heat to tank waste and results in bump after mixer pump shutdown	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2	F1
18A X	WFD-01b-003	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Chemical reactions	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2	F1
18A X	WFD-01b-005	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Hazardous Condition	Consequence	Mitigation	SSC		Control Measure	Consequence Rank
				F1	F2		
18A X	WFD-01b-007	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	S2 F1 Controls based on accident analysis (Tank Bump).
18A X	WFD-01b-009	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	S2 F1 Controls based on accident analysis (Tank Bump).
18A X	WFD-01b-011	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	S2 F1 Controls based on accident analysis (Tank Bump).
18A X	WFD-01b-013	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Waste solids congregate in dead zones	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	S2 F1 Controls based on accident analysis (Tank Bump).
18A X	WFD-02c-003	Release of aerosolized waste from DST to atmosphere due to waste heating which causes a tank bump	Insulating factor due to fluffing greater than expected	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	S2 F1 Controls based on accident analysis (Tank Bump).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref. No.	Description	Consequence	SSCs	TSRs	Freq. Rate	Freq. Rate
18A WFD-03a-101 X	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an incorrect diluent solution, leading to waste heating which causes a tank bump	Mislabeled chemical used for supply of diluent, human error	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required Controls based on accident analysis (Tank Bump).
18A WFD-03f-001 X	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required Controls based on accident analysis (Tank Bump).
18A WFD-04a-027 X	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an excess concentration of diluent, leading to waste heating which causes a tank bump	Excess volume of caustic results in chemical reactions leading to tank bump	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required Controls based on accident analysis (Tank Bump).
18A WFD-06a-027 X	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing a tank bump	Excess volume of caustic results in chemical reactions leading to a tank bump	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required Controls based on accident analysis (Tank Bump).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row #	Category	Description	Consequence	SSC	Control	Condition	SSC	Control	Condition
I8A X	WFD- 10a-002	Release of aerosolized waste from DST to atmosphere due to tank bump caused by addition of liquid to overheated concentration of heat-generating solids in sludge layer left unattended for an extended time	Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S3 F2
I8A X	WFD- 17f-001	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increases that result in tank bump	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2 F1
I8A X	WFD- 23f-001	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the contractor tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increase that result in tank bump	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2 F1
I8A X	WFD- 28b-005	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).	S2 F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

18A X	WFD- 28b-007	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).
18A X	WFD- 28b-009	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Inadequate annulus annulus ventilation flow	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).
18A X	WFD- 28b-011	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus annulus ventilation system	SS: Temp Mon Sys SS: Tank Level Detect Sys	None required	LCO: DST and AWF Tank Waste Temp Cntrls AC: Trans Cntrls (Tank Bump) AC: Process Instrument/Measure/Test Equip	None required	Controls based on accident analysis (Tank Bump).
21X	WFD- 02a-004	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line that leads to mechanical failure of the transfer line	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	None required	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Cas.	Prev. SSC	Mit. SSC	Prev. TS	Mit. TS	Cont. Memo	Cont. Rank	Freq. Rank
21X	WFD-02a-007	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-02a-012	Release of tank waste to soil and/or atmosphere from a leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S3	F1
21X	WFD-03a-005	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Plugging/freezing of diluent line causes mechanical failure of transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-03a-009	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical failure of transfer line	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls
21X	WFD-03a-014	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Initial State	Prev. SSC	Next SSS	Prev. TSR	Next TSR	Control Memo	Cons. Rank	Freq. Rank
21X	WFD-03a-018	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encasements SC: Transfer Leak Detection Systems SS: Tank Level Detection Systems SC: Transfer System Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine) SC: Pipe Encas	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03a-023	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Procedural/Hu man error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	None required	SC Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref.	Ref ID	Hazard Condition	Consequence	SSCs	TSRs	SSCs	TSRs	SSCs	TSRs
21X	WFD-03a-027	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
21X	WFD-03a-031	Release of tank waste to atmosphere from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
21X	WFD-03a-032	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-03a-036	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03a-041	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03a-045	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-03a-068	Release of tank waste to soil from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	None required	SC Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03a-072	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	None required	SC Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03a-093	Release of tank waste to soil from an aboveground pool leak of waste from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	None required	SC Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Category	Consequence	SSC	TSR	S3		S2		F3	
					AC	LCO	AC	LCO	AC	LCO
21X	WFD-03a-097	Release of tank waste to soil from an aboveground pool leak of waste from a failed (new) transfer line	Mislabelled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	None required	SC Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03c-013	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	None required	SC Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03c-017	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	None required	SC Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
21X	WFD-03d-006	Release of tank waste to soil from a pool leak of waste	Misrouting	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03d-012	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03d-016	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref ID	Title	Description	Consequence	Safety System Control		Control Level	Control Type
				SC	AC		
21X	WFD-03d-024	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls
21X	WFD-03d-028	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls
21X	WFD-03d-036	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Acc.	Item ID	Hazardous Conditions	Cause	Prev SCS	Next SCS	Prev TSRS	Next TSRS	Control Method	Cons. Rank	Freq. Rank
21X	WFD-03d-040	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03d-042	Release of tank waste to soil from a pool leak from a failed transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-03d-047	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Transfer line valve failures/misting causes line to plug that results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) Cntrls AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep-Acc	Item ID	Hazardous Conditions	Cause	Prev. SSC	Mit. SSC	Prev. TSR	Mit. TSR	Concs. Rank	Freq. Rank
21X	WFD-03d-051	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug, that results in mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
21X	WFD-03d-060	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump and mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
21X	WFD-03d-064	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump and mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

2IX	WFD-03d-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Valve closure leads to mechanical failure of the transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
2IX	WFD-03d-072	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Valve closure leads to mechanical failure of the transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3
2IX	WFD-03d-080	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Pump speed setting too high causes mechanical failure of the transfer line due to increased erosion of the transfer line	None required	SC: Pipe Encas Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-03d-084	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical failure of the transfer line due to increased erosion of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2 F3 Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03d-089	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2 F3 Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03d-093	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2 F3 Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

2IX	WFD-03d-098	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes the line to plug and results mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
2IX	WFD-03d-102	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes the line to plug and results mechanical failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
2IX	WFD-03d-106	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical line failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

					S2	F3
21X	WFD-03d-110	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical line failure of the transfer line	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03e-014	Release of tank waste to soil from a pool leak of waste	Misrouting: Human error or mechanical malfunction	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03e-018	Release of tank waste to soil from a pool leak from a failed transfer line	Transfer line leak	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

						S2	F3
21X	WFD-03f-009	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature (e.g., phosphate ring)	None required	SC: Pipe Eincas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Eincas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-03f-013	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature(e.g., phosphate ring)	None required	SC: Pipe Eincas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Eincas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-09a-018	Release of tank waste to soil from an aboveground pool leak from a failed transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	None required	SC: Pipe Eincas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Eincas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
21X	WFD-09a-050	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-17a-031	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-17a-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

					S2	F3
21X	WFD-17a-072	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	None required SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-17a-097	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	None required SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-17c-006	Release of tank waste to soil from a pool leak of waste	Misrouting	None required SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls LCO: Trans Cntrls (Pool) LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Event ID	WFD-#	Description	Small transfer line leak	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3	
21X	WFD-17c-042	Release of tank waste to soil from a pool leak from a failed transfer line									
21X	WFD-17c-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Valve closure causes mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3	
21X	WFD-17e-005	Release of tank waste to soil from a pool leak from a failed transfer line	Transfer line leak	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3	

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row #	Event ID	Description	Safety System Control (SSC) / Triggering Condition			Control Measure	Consequence Rank
			SC: Pipe Encas	SC: Trans Leak Detect Sys	AC: Trans Cntrls (Pool)		
21X	WFD-23a-032	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	None required	SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool). S2 F3
21X	WFD-23a-063	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool). S2 F3
21X	WFD-23a-093	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool). S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-23c-024	Release of tank waste to atmosphere from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Critis (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Critis (Pool) AC: Encas Seal Loop Critis AC: Emergency Prep AC: Trans Sys Cover Removal Critis	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-23c-051	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Critis (Pool) AC: Trans Pump Admin Pump Lock Critis	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Critis (Pool) AC: Encas Seal Loop Critis AC: Emergency Prep AC: Trans Sys Cover Removal Critis	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X	WFD-23c-083	Release of tank waste to soil and atmosphere from an underground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of the transfer line walls	None required	SC: Pipe Encas SC: Trans Leak Detect Syss SS: Tank Level Detect Syss SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Critis (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Syss AC: Trans Critis (Pool) AC: Encas Seal Loop Critis AC: Emergency Prep AC: Trans Sys Cover Removal Critis	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Condition	Cause	Pri/SSC	Mt/SSC	Pri/TSR	Mt/TSR	Contl Memo	Cons Rank	Freq Rank
21X	WFD-26a-050	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-26a-086	Release of tank waste to soil from a pool leak due to mechanical failures and misrouting	Human error; failure of flush line valves AND pressure switches from caustic additions system	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3
21X	WFD-26c-047	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failure/misrouting causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Item ID	Description	Potential Consequence	SSCs	TSRs	SSCs	TSRs	SSCs	TSRs
21X WFD-26c-060	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump and results in mechanical line failure	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X WFD-26c-084	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of transfer line walls	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).
21X WFD-26c-089	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste theology not as expected causes mechanical line failure due to increased erosion of transfer line walls	None required	SC: Pipe Encas Detect Sys SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Cntrls (Pool) LCO: Trans Cntrls (Pool) AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	Controls based on accident analysis (Subsurface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-326-042	Release of tank waste to soil from a pool leak or waste	Small transfer line leak	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2	F3
21X	WFD-326-005	Release of tank waste to soil from a pool leak or waste	Transfer line leak	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2	F3
21X	WFD-35a-009	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Con's Rank	Freq Rank
21X	WFD-35a-068	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2	F3
21X	WFD-35d-087	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S3	F2
21X	WFD-35d-091	Release of tank waste to soil from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool)	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S3	F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

21X	WFD-41a-014	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	None required	SC: Pipe Encas SC: Trans Leak Detect Sys SS: Tank Level Detect Sys SC: Trans Sys Covers SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Splash, Splatter, and Shine)	AC: Trans Cntrls (Pool) AC: Trans Pump Admin Pump Lock Cntrls	LCO: Trans Sys Covers LCO: Trans Leak Detect Sys AC: Trans Cntrls (Pool) AC: Encas Seal Loop Cntrls AC: Emergency Prep AC: Trans Sys Cover Removal Cntrls	S2	F3
23X	WFD-03a-103	Release of toxic vapors from diluent system due to damage from unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions					S2	F3
23X	WFD-17a-103	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions					S2	F3
23X	WFD-35a-103	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions					S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

					S2	F1
26X	WFD-03a-074	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction during diluent addition leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	<p>SC: Trans Leak Detect Sys</p> <p>SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity)</p> <p>SC: Primary Tank Leak Detect Sys</p> <p>SC: Trans Sys Supplemental Covers</p> <p>SS: Tank Level Detection Systems</p> <p>SS: Transfer System Covers</p> <p>SS: 204-AR Waste Unloading Facility Structure</p> <p>SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (splash, splatter, and shine)</p>	<p>LCO: Service Water Pressure Detect Sys</p> <p>AC: Trans Cntrls (Pool)</p> <p>AC: Trans Pump Admin Lock Cntrls</p> <p>AC: Excavation Cntrls</p> <p>LCO: Trans Sys Covers and RCSTS Entry Doors</p> <p>LCO: Trans Leak Detect Sys</p> <p>LCO: Primary Tank Leak Detect Sys</p> <p>LCO: Supplemental Covers</p> <p>AC: Trans Cntrls (Pool)</p> <p>AC: Emergency Prep (Waste Leak)</p> <p>AC: Trans Sys Cover Removal Cntrls</p> <p>AC: Excavation Cntrls</p> <p>AC: HEPA Filter Controls (Efficiency, Source Term)</p> <p>Controls based on accident analysis (Surface Leak Resulting in Pool).</p>

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
26X	WFD-03a-076	Release of tank waste to the soil due to a pool leak due to a misrouting	Procedural/human error during diluent addition leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detection Systems SS: Transfer System Covers SS: 204-AR Waste Unloading Facility Structure SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2	F1
26X	WFD-03a-086	Release of Tank Waste to the soil from the Diluent Addition system due to failure of valves and pressure switches in the diluent addition system flush line while the transfer pump is operating	Human error	SC: Service Water Pressure Detection Systems	None required		LCO: Service Water Pressure Detection Systems	Controls based on accident analysis (Surface Leak Resulting in Pool) and WFD control decision process.	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-03d-007	Release of tank waste to atmosphere from a spray leak due to misrouting	Misrouting into a structure leads to overfilling structure	SC: Pressure Switch Intrllks or Alarms (Service Water Lines) SS: Backflow Prev Devices	LCO: Service Water Pressure Detect Syss SC: Trans Leak Detect Syss SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Syss SC: Trans Sys Supplemental Covers SS: Tank Level Detect Syss SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct
					LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Syss LCO: Primary Tank Leak Detect Syss LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)
					Controls based on accident analysis (Surface Leak Resulting in Pool).
					S3 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Hazard	Consequence	SSC	TSR	Control Measure		
					S3	S2	
26X	WFD-03d-053	Release of tank waste to soil from a pool leak of waste	Transfer line valve failure/misrouting	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls LCO: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak)

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-03e-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, leakage leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls AC: Primary Tank Leak Detect Sys AC: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

RPP Ref.	Item ID	Hazardous Condition	Consequence	Mass	SSC	TSR	Control Metric	Cost Estimate	Freq. Rank	
26X	WFD-03e-015	Release of tank waste to atmosphere from a spray leak due to misrouting	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste	SC: Pressure Switch Intriks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	\$3	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

					S2	F3
26X	WFD-03e-021	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of simultaneous transfer or flush, leakage, and an extended transfer duration causes overfilling intermediate waste feed tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (splash, splatter, and shine)	LCO: Servic Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Event ID	Event Description	Consequence	Safety System			Control Measure	
			S3	S2	F3		
26X WFD-04a-003	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

						S2	F3
26X	WFD-04a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation results in overfilling waste feed tank	SC: Pressure Switch Intriks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref.	Ident.	Hazard Condition	SSC	TSR	Cont.		
					F3		
					S2		
26X	WFD-04a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls LCO: Trans Leak Detect Sys AC: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-09c-006	Release of tank waste to soil from a pool leak of waste due to misrouting	Misrouting	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)
				SC: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)
					S2
					F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Pre- TSR	Min TSR	Control Memo	Cons Rank	Freq Rank
26X	WFD-17a-074	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction during diluent addition leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep. Act.	Item ID	Hazardous Conditions	Cause	Prev. SSC	Mr. SSC	Prev. ISR	Mr. ISR	Control Memo	Cons. Rank	Freq. Rank
26X	WFD-17a-076	Release of tank waste to the soil due to a pool leak due to a misrouting	Procedural/human error during diluent addition leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2	F1

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-20a-008	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling destination waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls AC: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Ref ID	Ref ID	Hazard	Consequence	SSC	TSR	Control based on accident analysis (Surface Leak Resulting in Pool).	S2	F3
26X	WFD-20a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling waste tank	SC: Pressure Switch Intriks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls LCO: Trans Cntrls (Pool) LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Title	Description	Equipment	S3			S2			S1		
				SC	SS	AC	SC	SS	AC	SC	SS	AC
26X	WFD-20a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	F3	S2	

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
26X	WFD-23c-006	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys AC: Trans Cntrs (Pool) AC: Trans Pump Admin Lock Cntrs AC: Excavation Cntrs	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrs (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrs AC: Excavation Cntrs AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-26e-002	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste and produces a leak	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct
					LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls
					LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls
					AC: HEPA Filter Controls (Efficiency, Source Term)
					S3
					F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev/SSC	Mit/SSC	Prev/TSR	Mit/TSR	Control Memo	Cons Rank	Freq Rank
26X	WFD-29a-010	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

			S3	S2	F3
26X	WFD-29a-012	Release of tank waste to the soil due to a pool leak due to a misrouting	<p>Equipment malfunction leads to overfilling of waste tank</p> <p>SC: Pressure Switch Intrks or Alarms (Service Water Lines)</p> <p>SS: Backflow Prev Devices</p>	<p>SC: Trans Leak Detect Sys</p> <p>SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity)</p> <p>SC: Primary Tank Leak Detect Sys</p> <p>SC: Trans Sys Supplemental Covers</p> <p>SS: Tank Level Detect Sys</p> <p>SS: Trans Sys Covers</p> <p>SS: 204-AR Waste Unloading Facility Struct</p> <p>SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (splash, splatter, and shine)</p>	<p>LCO: Service Water Pressure Detect Sys</p> <p>AC: Trans Cntrls (Pool)</p> <p>AC: Trans Pump Admin Lock Cntrls</p> <p>AC: Excavation Cntrls</p> <p>LCO: Trans Sys Covers and RCSTS Entry Doors</p> <p>LCO: Trans Leak Detect Sys</p> <p>LCO: Primary Tank Leak Detect Sys</p> <p>LCO: Supplemental Covers</p> <p>AC: Trans Cntrls (Pool)</p> <p>AC: Emergency Prep (Waste Leak)</p> <p>AC: Trans Sys Cover Removal Cntrls</p> <p>AC: Excavation Cntrls</p> <p>AC: HEPA Filter Controls (Efficiency, Source Term)</p>

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row ID	Process ID	Description	S3 Consequence	S2 Consequence	S1 Consequence	Control / Countermeasure	Review Date	Review By
26X	WFD-32c-001	Release of tank waste to atmosphere from a pool leak due to mechanical failures and misrouting	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	SC: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Contl Memo	Cons Rank	Freq Rank
26X	WFD-35d-007	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting results in the structure over filling with tank waste and produces a leak	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S3	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

26X	WFD-35e-012	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, leakage leads to overfilling of waste tank	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pts, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S2 F2

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
26X	WFD-351-015	Release of tank waste to soil and atmosphere from a spray leak of waste	Misrouting caused by human error or mechanical malfunction that results in the structure over filling and produces a leak	SC: Pressure Switch Intrks or Alarms (Service Water Lines) SS: Backflow Prev Devices	SC: Trans Leak Detect Sys SC: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (Physical Integrity) SC: Primary Tank Leak Detect Sys SC: Trans Sys Supplemental Covers SS: Tank Level Detect Sys SS: Trans Sys Covers SS: 204-AR Waste Unloading Facility Struct SS: Abovegrade Portions of Process Pits, Diversion Boxes, Vault Pits, and COBs (splash, splatter, and shine)	LCO: Service Water Pressure Detect Sys AC: Trans Cntrls (Pool) AC: Trans Pump Admin Lock Cntrls AC: Excavation Cntrls	LCO: Trans Sys Covers and RCSTS Entry Doors LCO: Trans Leak Detect Sys LCO: Primary Tank Leak Detect Sys LCO: Supplemental Covers AC: Trans Cntrls (Pool) AC: Emergency Prep (Waste Leak) AC: Trans Sys Cover Removal Cntrls AC: Excavation Cntrls AC: HEPA Filter Controls (Efficiency, Source Term)	Controls based on accident analysis (Surface Leak Resulting in Pool).	S3	F3
29X	WFD-02a-006	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-02a-010	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-004	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Plugging/free zing of diluent line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

29X	WFD-03a-008	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-013	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-017	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-022	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/hu man error in startup of diluent addition	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-026	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Procedural/hu man error in startup of diluent addition	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-035	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	
29X	WFD-03a-040	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Restriction in diluent line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3	

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Case ID	WFD-03a-#	Description	Control Type	Control Details	Control Basis				
29X	WFD-03a-044	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-053	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-067	Release of tank waste to soil from a failed (existing) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-071	Release of tank waste to soil from a failed (new) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-092	Release of tank waste to soil from an underground pool leak or waste from a failed (existing) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03a-096	Release of tank waste to soil from an underground pool leak or waste from a failed (new) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03e-012	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Rep Acc	Item ID	Hazardous Conditions	Cause	Prev SSC	Mit SSC	Prev TSR	Mit TSR	Control Memo	Cons Rank	Freq Rank
29X	WFD-03c-016	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernatant	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-011	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-015	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-023	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-027	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-035	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Small transfer time leak	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-039	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Small transfer time leak	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

29X	WFD-03d-046	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line (existing) transfer line	Transfer line valve failures/misrouting	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume) AC: Trans Pump Admin Lock Cntrs	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-050	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume) AC: Trans Pump Admin Lock Cntrs	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-059	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-063	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-067	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Valve closure	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume) AC: Trans Pump Admin Lock Cntrs	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-071	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Valve closure	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume) AC: Trans Pump Admin Lock Cntrs	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-03d-079	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Pump speed setting too high	None required	SS: Pipe Encas Detect Sys	AC: Trans Cntrs (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrs	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Category	WFD-03d ID	Description	Pump speed setting too high	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-083	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-088	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-092	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-097	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-101	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-105	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03d-109	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas (Subsurface Plume) SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	LCO: Trans Cntrls Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

29X	WFD-03f-008	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-03f-012	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-09a-031	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-09a-072	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-09b-018	Release of tank waste to soil from an underground pool leak from a failed transfer line	Transfer piping at lower temperature than supernate	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-09c-109	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	None required	SS: Pipe Encas SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Sys AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Row ID	Acc.	Description	Initial Consequence	Initial Safety System	Initial TSRS	Final Consequence	Final Safety System	Final TSRS	Control Level
29X	WFD-15e-012	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-17a-022	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume) AC: Trans Pump Admin Lock Cntrls	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-17a-067	Release of tank waste to soil from an underground pool leak from a failed (new) (existing) transfer line	Decision to minimize diluent addition to a particular transfer	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-17a-071	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-17a-092	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3
29X	WFD-17a-096	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	None required	SS: Pipe Encas SS: Trans Leak Detect Syss SS: Tank Level Detect Syss	AC: Trans Cntrls (Subsurface Plume)	LCO: Trans Leak Detect Syss AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2 F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

Consequence	SSC	Description	Required	SS: Pipe Encas (Subsurface Plume)	LCO: Trans Cntrls Sys	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-17c-011	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls			
29X	WFD-17f-008	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-26b-018	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-26c-083	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Pump speed setting too high	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-26c-088	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3
29X	WFD-32a-035	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	None required SS: Trans Leak Detect Sys SS: Tank Level Detect Sys	AC: Trans Cntrls (Subsurface Plume) AC: Trans Cntrl (Subsurface Plume) AC: Encas Seal Loop Cntrls	Controls based on accident analysis (Subsurface Leak Remaining Subsurface)	S2	F3

Table C-7. Safety SSCs and TSRs for Potential S3 and S2 Consequences. (99 Sheets)

ID	Hazard ID	Description	Procedural/Human Error	None required	SS: Tank Level Detect Syss		AC: Trans Cntrls (Subsurface Plume)		LCO: Trans Leak Detect Sys		Controls based on accident analysis (Subsurface Leak Remaining Subsurface)		S2	F3
					SS: Pipe Encas	SS: Trans Leak Detect Syss	AC: Trans Pump Admin Lock Cntrls	AC: Encas Seal Loop Cntrls	AC: Trans Cntrl (Subsurface Plume)	AC: Encas Seal Loop Cntrls	AC: Trans Cntrls (Subsurface Plume)	AC: Encas Seal Loop Cntrls		
29X	WFD-32a-062	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	man error in startup of diluent addition											

This page intentionally left blank.

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material & Risk	Hazardous Condition	Risk Level	Cost	Cost Cap	Rep. Acc.
ANALYZED ACCIDENT: Flammable Gas Deflagrations - DST							
FSAR Section 3.4.2.2. Flammable Gas Deflagrations							
A-1-a	ITK-10-b	DST tank inventory	Release of radioactive material from in-tank fire or explosion due to intrusive activity (dome collapse)	Spark from equipment or tools	F3	S3	B04
HAZARDOUS CONDITIONS							
A-1-a	WFD-01a-005	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Surface crust prevents gas passage (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-01a-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Crust is semi-permeable (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-01a-022	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	More gas retained in waste than theoretically expected (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-01a-025	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Mixer pump operation too aggressive (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-01a-028	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Waste mixing is more efficient than expected (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-02b-004	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Higher than expected gas generation rate (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-02b-007	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of degassed waste	Solids trap greater than expected amount of gas during in tank settling (Ignition source assumed present)	F2	S3	B08
A-1-a	WFD-03a-098	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1	S3	B08
C-1-a	WFD-03a-100	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mislabeled chemical used for supply of diluent, human error leads to chemical reactions resulting in GRE (no ignition source assumed present)	F1	S2	D14
A-1-a	WFD-03d-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Equipment malfunction (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-03d-073	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation to degas waste	Pump speed setting too high (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-04a-014	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Incorrect caustic batch composition (Ignition source assumed present)	F1	S3	B08
C-1-a	WFD-04a-016	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Incorrect caustic batch composition results in chemical reactions leading to a GRE (no ignition source assumed present)	F1	S2	D14
A-1-a	WFD-04a-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Insufficient volume of caustic (Ignition source assumed present)	F1	S3	B08
C-1-a	WFD-04a-019	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to a failure of DST confinement	Insufficient volume of caustic in chemical reactions leading to a GRE (no ignition source assumed present)	F1	S2	D14
A-1-a	WFD-04a-023	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer (with diluent addition)	Excess volume of caustic (Ignition source assumed present)	F1	S3	B08

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Location	Hazardous Condition	Event Type	Event Description	Consequence
C-1-a	WFD-04a-025	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement		Excess volume of caustic results in chemical reactions leading to a GRE (no ignition source assumed present)	F1 S2 D14 04X
B-1-a	WFD-06a-035	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement		Mislabeled chemical used for supply of diluent, human error leads to chemical reactions resulting in GRE (no ignition source assumed present)	F1 S2 D14 04X
C-1-a	WFD-12a-027	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement		Excess volume of caustic creates chemical reactions leading to a GRE (no ignition source assumed present)	F1 S2 D14 04X
A-1-a	WFD-17c-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned transfer of waste		Equipment malfunction (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-17c-073	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer		Pump speed setting too high (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-19a-005	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation		Surface crust prevents gas passage (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-19a-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation		Crust is semi-permeable (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-19a-022	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation		More gas retained in waste than theoretically expected (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-19a-025	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation		Mixer pump operation too aggressive (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-19a-028	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation		Waste mixing is more efficient than expected (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-20a-014	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of thinning chemicals		Incorrect caustic batch composition (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-20a-017	Tank Inventory	Release of aerosolized wastes to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of thinning chemicals		Insufficient volume of caustic (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-20a-023	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned addition of thinning chemicals		Excess volume of diluent (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-22b-004	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of solids		Higher than expected gas generation rate (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-22b-007	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of waste		Solids trap greater than expected amount of gas during in tank settling (Ignition source assumed present)	F2 S3 B08 04X
A-1-a	WFD-23a-098	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer		Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-23c-017	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer		Equipment malfunction (Ignition source assumed present)	F1 S3 B08 04X
A-1-a	WFD-26c-073	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned waste transfer		Pump speed setting too high (Ignition source assumed present)	F1 S3 B08 04X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Mechanism at Risk	Condition	Consequence	Prob. Level	Consequence	Prob. Level
A-1-a	WFD-29a-032	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during addition of stimming chemicals	Mislabeled chemical used for supply of diluent, human error (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-31b-004	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned settling of waste	Higher than expected gas generation rate (Ignition source assumed present)	F1	S3	B08
A-1-a	WFD-40b-004	Tank Inventory	Release of aerosolized waste to atmosphere due to ignition of flammable gas in the head space of DST during planned mixer pump operation	Higher than expected gas generation rate (Ignition source assumed present)	F1	S3	B08
ANALYZED ACCIDENT: HEPA Filter Failure - Exposure to High Temperature or Pressure							
FSAR Section 3.3.2.4.2, <i>HEPA Filter Failure - Exposure to High Temperature or Pressure</i>				Fire in or around ventilation system	F2	S2	B09
A-1-a				High Temperature or Pressure	06		
HAZARDOUS CONDITIONS							
C-1-a	WFD-01a-007	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Surface crust prevents gas passage leading to GRE pressurizing headspace (no ignition source assumed present)	F2	S2	D14
C-1-a	WFD-01a-019	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	More gas retained in waste than theoretically expected resulting in GRE pressurization headspace (no ignition source assumed present)	F2	S2	D14
C-1-a	WFD-01a-027	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Mixer pump operation too aggressive resulting in GRE pressurizing headspace (no ignition source assumed present)	F2	S2	D14
C-1-a	WFD-01a-030	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Waste mixing is more efficient than expected resulting in more gas evolution than expected (no ignition source assume present)	F2	S2	D14
C-1-a	WFD-02b-006	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Higher than expected gas generation rate results in GRE leading to headspace pressurization (no ignition source assumed present)	F1	S2	D14
C-1-a	WFD-02b-009	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Solids trap greater than expected amount of gas during in tank settling resulting in GRE pressurizing headspace (no ignition source present)	F2	S2	D14
C-1-a	WFD-03d-019	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Equipment malfunction leads to low flow transfer allowing more gas buildup time in tank leading to GRE (no ignition source assumed present)	F1	S2	D14
C-1-a	WFD-03d-075	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste to atmosphere due to an unacceptable GRE leading to a failure of DST confinement	Pump speed setting too high results in excessively fast transfer leading to a rapid decrease in hydrostatic head that creates GRE (no ignition source assumed present)	F2	S2	D14

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BR	Item ID	Material Inside	MISF	ANALYZED ACCIDENT: Organic Solvent Fire/Organic Salt-Nitrate Reaction								
				FSAR Section 3.4.2.6, Organic Salt-Nitrate Reaction				Spark from failure to use non-sparking tools or sparks from welding, cutting, grinding, etc.				
				HAZARDOUS CONDITIONS				F3	S2	E09	09	
A-1-a	RSR-07-1			Release of radioactive or toxic material from facility due to in-facility fire or explosion during riser removal activity (chosen to represent all organic nitrate tanks)				Extended mixer pump operation increased heat load in tank	F1	S2	D01	09X
B-1-a	WFD-01b-002	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes runaway chemical reactions				Chemical reactions created as a result of increasing waste temperature through mixer pump operation	F1	S2	D01	09X
B-1-a	WFD-01b-004	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions				Inadequate primary ventilation flow to remove heat generated by mixer pump operation	F1	S2	D07	09X
B-1-a	WFD-01b-006	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow				Failure of primary ventilation system results in head build up from operating mixer pump	F1	S2	D07	09X
B-1-a	WFD-01b-008	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no primary ventilation flow				Inadequate annulus ventilation flow to remove head generated by mixer pump operator	F1	S2	D07	09X
B-1-a	WFD-01b-010	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow				Failure of annulus ventilation system results in head build up from operating mixer pump	F1	S2	D07	09X
B-1-a	WFD-01b-012	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow				Waste solids congregate in dead zones resulting in head build up	F1	S2	D07	09X
B-1-a	WFD-01b-014	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes runaway chemical reactions				Insulating factor due to fluffing greater than expected resulting in increased tank waste temperatures	F1	S2	D01	09X
B-1-a	WFD-02c-004	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to waste heating which causes runaway chemical reactions				Decision made to add no diluent to tank (results in dry waste heel)	F2	S3	D01	09X
B-1-a	WFD-04a-001	Tank Dome Space Contents		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat generating solids in sludge layer left unattended for an extended time				Excess volume of caustic leads to unexpected chemical reactions in tank waste	F1	S3	D01	09X
B-1-a	WFD-04a-028	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing runaway chemical reactions				Inadequate annulus ventilation flow to remove heat generated by mixer pump operation	F1	S2	D07	09X
B-1-a	WFD-05b-010	Tank Inventory		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow				Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	F3	S3	D01	09X
B-1-a	WFD-10a-001	Tank Dome Space Contents and Filter Burden		Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat generating solids in sludge layer left unattended for an extended time				Decision made to add no diluent to tank	F2	S3	D01	09X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material at Risk	Hazardous Conditions	Consequence	Free Rank	Cross Rank	Cause Grp	Top Acc
B-1-a	WFD-19b-012	Tank Inventory	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system results in heat build up from operating mixer pump	F1	S2	D07	09X
B-1-a	WFD-29a-001	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by concentration of heat-generating solids in sludge layer left unattended for an extended time	Decision made to add no diluent to tank	F2	S3	D01	09X
ANALYZED ACCIDENT: Spray Leak in Structure or from Overground Transfer Lines								
B-1-a	X5-06-FLOW02	DCRT waste being transferred to Tank 241-SY-102	Release of liquid radioactive waste from DCRT transfer piping to Tank 241-SY-102 due to spray leak in DCRT pump pit	Pipe failure in DCRT pump pit causing spray leak	F2	S3	D12	15
HAZARDOUS CONDITIONS								
C-1-a	WFD-03a-085	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Human error, failure of flush line valves AND pressure switches results in reverse flow of waste into diluent system	F3	S3	E06	15X
C-1-a	WFD-03a-087	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing transfer flush from AN, AY, or AZ Farms to AW Farm	F3	S2	D12	15X
C-1-a	WFD-03d-052	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak from a failed transfer line or transfer line valve	Transfer line valve failures/misrouting	F3	S3	D12	15X
C-1-a	WFD-04a-029	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak from a diluent addition system	Siphon caused by elevation differences when providing dilution feed from AN, AY, or AZ Farms to AW Farm	F3	S2	D12	15X
C-1-a	WFD-09c-052	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to misrouting	Transfer line valve failures/misrouting that leads to line plugging and results in mechanical line failure	F3	S3	D12	15X
C-1-a	WFD-17c-052	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line valve failures/misrouting	F3	S3	E06	15X
C-1-a	WFD-26c-052	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Transfer line valve failures/misrouting	F3	S3	E06	15X
C-1-a	WFD-29a-004	Transfer Line Inventory	Release of tank waste to soil or atmosphere from a spray or pool leak from a diluent addition system	Equipment malfunction: Pump failure, diluent line plug/freeze, diluent line break	F3	S2	D12	15X
C-1-a	WFD-35d-052	Transfer Line Inventory	Release of tank waste to soil and atmosphere from a spray leak of waste	Transfer line valve failures/misrouting	F3	S3	E06	15X
ANALYZED ACCIDENT: Spray Leak from Underground Waste Transfer Lines								
B-1-a	EE-16	Material leaked from transfer line	Release of radioactive and hazardous material from transfer line spray leak due to excavation error	Excavation into waste transfer line during a transfer	F3	S3	D22	16
HAZARDOUS CONDITIONS								
C-1-a	WFD-02a-005	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	F0	S3	D02	16X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material at Risk	Hazardous Conditions		Cause	Freq Rank	Cons Rank	Cause Grp	Rep Acc
			Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line					
C-3-a	WFD-02a-008	Transfer Line Inventory	Solids settle in tank less quickly than anticipated		F2	S3	D02	16X	
C-1-a	WFD-02a-009	Transfer Line Inventory	Solids settle in tank less quickly than anticipated		F2	S3	D02	16X	
C-3-a	WFD-03a-002	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F0	S3	D02	16X	
C-1-a	WFD-03a-003	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-3-a	WFD-03a-006	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-1-a	WFD-03a-007	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-3-a	WFD-03a-011	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-1-a	WFD-03a-012	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-3-a	WFD-03a-015	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-1-a	WFD-03a-016	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-3-a	WFD-03a-020	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-1-a	WFD-03a-021	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-3-a	WFD-03a-024	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-1-a	WFD-03a-025	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-3-a	WFD-03a-029	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-1-a	WFD-03a-030	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-3-a	WFD-03a-033	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-1-a	WFD-03a-034	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line		F2	S3	D02	16X	
C-3-a	WFD-03a-038	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-1-a	WFD-03a-039	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line		F0	S3	D02	16X	
C-3-a	WFD-03a-042	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line		F2	S3	D02	16X	

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Accident ID	Mechanism	Hazardous Condition	Control Measure	Control Type	Control Rating
C-1-a	WFD-03a-043	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Restriction in diluent line	F2	S3
C-3-a	WFD-03a-065	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0	S3
C-1-a	WFD-03a-066	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0	S3
C-3-a	WFD-03a-069	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	S3
C-1-a	WFD-03a-070	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2	S3
C-3-a	WFD-03a-090	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	S3
C-1-a	WFD-03a-091	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	S3
C-3-a	WFD-03a-094	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	S3
C-1-a	WFD-03a-095	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	S3
C-3-a	WFD-03c-010	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0	S3
C-1-a	WFD-03c-011	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0	S3
C-3-a	WFD-03c-014	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F2	S3
C-1-a	WFD-03c-015	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F2	S3
C-3-a	WFD-03d-009	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Equipment malfunction	F0	S3
C-1-a	WFD-03d-010	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Equipment malfunction	F0	S3
C-3-a	WFD-03d-013	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction	F2	S3
C-1-a	WFD-03d-014	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Equipment malfunction	F2	S3
C-3-a	WFD-03d-021	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	S3
C-1-a	WFD-03d-022	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	S3
C-3-a	WFD-03d-025	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F2	S3
C-1-a	WFD-03d-026	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F2	S3

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Location	MATERIAL	Hazardous Condition	Cause	Consequence	Prob.	Prob.	Prob.	Prob.	Ref. Acc.
C-3-a	WFD-03d-033 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Small transfer line leak	F0	S3	D02	16X		
C-1-a	WFD-03d-034 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Small transfer line leak	F0	S3	D02	16X		
C-3-a	WFD-03d-037 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Small transfer line leak	F0	S3	D02	16X		
C-1-a	WFD-03d-038 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Small transfer line leak	F0	S3	D02	16X		
C-1-a	WFD-03d-041 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from a spray leak from a failed transfer line	Small transfer line leak	F0	S3	D12	16X		
C-3-a	WFD-03d-044 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F0	S3	D02	16X		
C-1-a	WFD-03d-045 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F0	S3	D02	16X		
C-3-a	WFD-03d-048 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F0	S3	D02	16X		
C-1-a	WFD-03d-049 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F0	S3	D02	16X		
C-3-a	WFD-03d-057 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	S3	D02	16X		
C-1-a	WFD-03d-058 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	S3	D02	16X		
C-3-a	WFD-03d-061 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F0	S3	D02	16X		
C-1-a	WFD-03d-062 Inventory	Transfer Line	Release of tank waste to atmospheric from an aboveground spray leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F0	S3	D02	16X		
C-3-a	WFD-03d-065 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Valve closure	F0	S3	D02	16X		
C-1-a	WFD-03d-066 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Valve closure	F0	S3	D02	16X		
C-3-a	WFD-03d-069 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Valve closure	F0	S3	D02	16X		
C-1-a	WFD-03d-070 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Valve closure	F0	S3	D02	16X		
C-3-a	WFD-03d-077 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Pump speed setting too high	F0	S3	D12	16X		
C-3-a	WFD-03d-081 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F0	S3	D12	16X		
C-1-a	WFD-03d-082 Inventory	Transfer Line	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	S3	D12	16X		
C-3-a	WFD-03d-086 Inventory	Transfer Line	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	S3	D12	16X		

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BRN	Item ID	Material	Hazardous Condition	Control	RCF
			Description	Plan	Op.
C-1-a	WFD-03d-087	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0 S3 D12 16X
C-3-a	WFD-03d-090	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D12 16X
C-1-a	WFD-03d-091	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D12 16X
C-3-a	WFD-03d-095	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0 S3 D02 16X
C-1-a	WFD-03d-096	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0 S3 D02 16X
C-3-a	WFD-03d-099	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D02 16X
C-1-a	WFD-03d-100	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D02 16X
C-3-a	WFD-03d-103	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0 S3 D02 16X
C-1-a	WFD-03d-104	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0 S3 D02 16X
C-3-a	WFD-03d-107	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D02 16X
C-1-a	WFD-03d-108	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2 S3 D02 16X
C-1-a	WFD-03e-019	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak from a failed transfer line	Transfer line leak	F0 S3 D12 16X
C-3-a	WFD-03f-006	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F0 S3 D02 16X
C-1-a	WFD-03f-007	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F0 S3 D02 16X
C-3-a	WFD-03f-010	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F2 S3 D02 16X
C-1-a	WFD-03f-011	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F2 S3 D02 16X
C-1-a	WFD-09a-066	Transfer Line Inventory	Release of tank waste to the atmosphere from an aboveground spray leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F0 S3 D02 16X
C-3-a	WFD-09a-069	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2 S3 D02 16X
C-1-a	WFD-09a-70	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F2 S3 D02 16X
C-1-a	WFD-09b-013	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F0 S3 D02 16X
C-3-a	WFD-15b-039	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0 S3 D02 16X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Mechanism	Hazardous Conditions	FCR	COP	RCM	COP	RCM
C-1-a	WFD-17a-095	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	S3	D16	16X
C-1-a	WFD-23c-058	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F0	S3	D02	16X
C-1-a	WFD-26a-012	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F0	S3	D02	16X
C-3-a	WFD-32a-094	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F2	S3	D16	16X
C-1-a	WFD-35d-082	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	S3	D12	16X
C-3-a	WFD-35d-090	Transfer Line Inventory	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Waste rheology not as expected	F2	S3	D12	16X
C-3-a	WFD-41a-091	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F0	S3	D16	16X
C-1-a	WFD-41d-022	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F0	S3	D02	16X
C-3-a	WFD-41d-081	Transfer Line Inventory	Release of tank waste to soil from an underground spray leak from a failed (new) transfer line	Pump speed setting too high	F2	S3	D12	16X
C-1-a	WFD-41d-087	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Waste rheology not as expected	F0	S3	D12	16X
ANALYZED ACCIDENT: Caustic Spray Leak FSAR Section 3.3.2.4.9, <i>Caustic Spray Leak</i>								
B-1-a	107AN-02-PRES	Contents of caustic truck	Release of caustic aerosol from caustic truck transfer piping due to spray leak	Piping/noise leak initiated by various causes	F3	S2	D12	17
HAZARDOUS CONDITION								
C-1-a	WFD-04a-004	Diluent Transfer Line Inventory	Release of diluent to soil and/or atmosphere from a leak from the diluent addition system	Equipment malfunction: Pump failure causes diluent line to plug and freeze which causes the diluent line to break	F3	S2	D12	17X
ANALYZED ACCIDENT: Tank Bump FSAR Section 3.4.2.1, <i>Tank Bump</i>								
B-1-a	102AW-02-TEMP02	DST tank vapors/aerosols	Release of radioactive aerosols from Tank 241-AW-102 due to tank bump	High heat waste combined with loss of ventilation contributes to tank bump	F2	S2	D01	18A
HAZARDOUS CONDITIONS								
B-1-a	WFD-01b-001	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to waste heating during extended mixer pump operation which causes a tank bump	Extended mixer pump operation adds significant heat to tank waste and results in bump after mixer pump shutdown	F1	S2	D01	18A X
B-1-a	WFD-01b-003	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Chemical reactions	F1	S2	D01	18A X
B-1-a	WFD-01b-005	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	F1	S2	D07	18A X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BN	Ident ID	Location/Risk	Hazardous Condition	Prob.	Conc. Rmt.	Conc. Grp.	Risk Assess.	
B-1-a	WFD-01b-007	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	F1	S2	D07	18A X
B-1-a	WFD-01b-009	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with inadequate annulus	Inadequate annulus ventilation flow	F1	S2	D07	18A X
B-1-a	WFD-01b-011	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system	F1	S2	D07	18A X
B-1-a	WFD-01b-013	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to waste heating during normal mixer pump operation which causes a tank bump	Waste solids congregate in dead zones	F1	S2	D01	18A X
B-1-a	WFD-02e-003	Tank Inventory	Release of aerosolized waste from DST to atmosphere due to waste heating which causes a tank bump	Insulating factor due to fluffing greater than expected	F1	S2	D01	18A X
B-1-a	WFD-03a-101	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an incorrect diluent solution, leading to waste heating which causes a tank bump	Mislabeled chemical used for supply of diluent, human error	F1	S2	D01	18A X
B-1-a	WFD-03f-001	Tank Inventory	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F1	S2	D01	18A X
B-1-a	WFD-04a-027	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to chemical reactions caused by addition of an excess concentration of diluent, leading to waste heating which causes a tank bump	Excess volume of caustic results in chemical reactions leading to tank bump	F1	S2	D01	18A X
B-1-a	WFD-06a-027	Tank Inventory	Release of aerosolized waste from DST to atmosphere due to runaway chemical reactions caused by addition of an excess quantity of diluent, causing a tank bump	Excess volume of caustic results in chemical reactions leading to a tank bump	F1	S2	D01	18A X
B-1-a	WFD-10a-002	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to tank bump caused by addition of liquid to overheated concentration of heat-generating solids in sludge layer left unattended for an extended time	Evaporation in as-left source tank residuals leading to residue of unstable material after sitting for many years	F2	S3	E01	18A X
B-1-a	WFD-17f-001	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the intermediate waste feed storage tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increases that result in tank bump	F1	S2	D01	18A X
B-1-a	WFD-23f-001	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to unexpected chemical reactions caused by exothermic reactions of transferred waste with unidentified materials in the contractor tank, causing a tank bump	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring) create potential temperature increase that result in tank bump	F1	S2	D01	18A X
B-1-a	WFD-28b-005	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with inadequate primary ventilation flow	Inadequate primary ventilation flow	F1	S2	D07	18A X
B-1-a	WFD-28b-007	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no primary ventilation flow	Failure of primary ventilation system	F1	S2	D07	18A X
B-1-a	WFD-28b-009	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with inadequate annulus ventilation flow	Inadequate annulus ventilation flow	F1	S2	D07	18A X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material at Risk	Hazardous Conditions	Cause	Freq Rank	Cons Rank	Cause Grp	Rep Acc
B-1-a	WFD-28b-011	Tank Dome Space Contents and Filter Burden	Release of aerosolized waste from DST to atmosphere due to a tank bump caused by overheating of waste from mixer pump operation with no annulus ventilation flow	Failure of annulus ventilation system	F1	S2	D07	18A X
			ANALYZED ACCIDENT: Subsurface Leak Resulting in Pool					
B-3-b	XS-07-FLOW02	Liquid radioactive waste transferred out of DCRT	Release of radioactive waste to soil from transfer piping out of 244 TX DCRT due to leak in primary pipe and encasement	Corrosion of inner and outer pipe	F3	S2	D16	21A
B-3-b	XS-07-FLOW06	Liquid radioactive waste transferred out of DCRT	Release of radioactive waste to soil from transfer pipe out of 244 TX DCRT due to leak in primary pipe and encasement	Water hammer causes failure of primary pipe and encasement	F3	S2	D17	21B
			HAZARDOUS CONDITIONS					
C-3-a	WFD-02a-004	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground spray leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line that leads to mechanical failure of the transfer line	F2	S3	D02	21X
C-2-b	WFD-02a-007	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	F3	S2	D02	21X
C-3-b	WFD-02a-012	Transfer Line Inventory	Release of tank waste to soil and/or atmosphere from a leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated causing a plugged line which results in mechanical failure of the transfer line	F1	S3	D12	21X
C-2-b	WFD-03a-005	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Plugging/freezing of diluent line causes mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-009	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical failure of transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-014	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-018	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-023	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-027	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition causes line to plug that leads to a mechanical failure to the transfer line	F3	S2	D02	21X
C-3-b	WFD-03a-031	Transfer Line Inventory	Release of tank waste to atmosphere from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-032	Transfer Line Inventory	Release of tank waste to soil from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material at Risk	Hazardous Conditions	Cause	Freq Rank	Cons Rank	Cause Grp	Rep Acc
C-2-b	WFD-03a-036	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-041	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-045	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Restriction in diluent line causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-068	Transfer Line Inventory	Release of tank waste to soil from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-072	Transfer Line Inventory	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes the line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03a-093	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak of waste from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	F3	S2	D16	21X
C-3-b	WFD-03a-097	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak of waste from a failed (new) transfer line	Mislabeled chemical used for supply of diluent that results in unexpected chemical reactions that cause mechanical failure of transfer	F3	S2	D16	21X
C-2-b	WFD-03c-013	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03c-017	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate causes line to plug that leads to mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03d-006	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste	Misrouting	F3	S2	D12	21X
C-2-b	WFD-03d-012	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	F3	S2	D02	21X
C-2-b	WFD-03d-016	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Equipment malfunction causes line to plug that leads to mechanical failure	F3	S2	D02	21X
C-2-b	WFD-03d-024	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03d-028	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting causes line to plug that results in mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03d-036	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	F3	S2	D02	21X
C-2-b	WFD-03d-040	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Small transfer line leak causes line to plug and results in mechanical failure of the transfer line	F3	S2	D02	21X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BN	Item ID	Mechanism	Hazardous conditions	Freq Rank	Caus. Prob.	Rcp. Prob.
C-2-b	WFD-03d-042	Transfer Line Inventory	Release of tank waste to soil from a pool leak from a failed transfer line	F3	S2	D12 21X
C-2-b	WFD-03d-047	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-051	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-060	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-064	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-068	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-072	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-080	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-084	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D12 21X
C-2-b	WFD-03d-089	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D12 21X
C-2-b	WFD-03d-093	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	F3	S2	D12 21X
C-2-b	WFD-03d-098	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-102	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-106	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	F3	S2	D02 21X
C-2-b	WFD-03d-110	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	F3	S2	D02 21X
C-2-b	WFD-03e-014	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste malfunction	F3	S2	D12 21X
C-2-b	WFD-03e-018	Transfer Line Inventory	Release of tank waste to soil from a pool leak from a failed transfer line	F3	S2	D12 21X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material at Risk	Hazardous Conditions			Cause	Cause Grp	Rep. Acc
			Freq.	Caus. Rank	Freq. Rank			
C-2-b	WFD-03F-009	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature (e.g., phosphate ring)	F3	S2	D02	21X
C-2-b	WFD-03F-013	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank caused by increased temperature(e.g., phosphate ring)	F3	S2	D02	21X
C-2-b	WFD-09a-018	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	F3	S2	D12	21X
C-2-b	WFD-09a-050	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical failure	F3	S2	D02	21X
C-3-b	WFD-17a-031	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-17a-068	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-17a-072	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-17a-097	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	F3	S2	D16	21X
C-2-b	WFD-17c-006	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste	Misrouting	F3	S2	D12	21X
C-2-b	WFD-17c-042	Transfer Line Inventory	Release of tank waste to soil from a pool leak from a failed transfer line	Small transfer line leak	F3	S2	D12	21X
C-2-b	WFD-17c-068	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Valve closure causes mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-17c-005	Transfer Line Inventory	Release of tank waste to soil from a pool leak from a failed transfer line	Transfer line leak	F3	S2	D12	21X
C-2-b	WFD-23a-032	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer causes line to plug and results in mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-23a-063	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition causes line to plug and results in mechanical line failure	F3	S2	D02	21X
C-2-b	WFD-23a-093	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent produces unexpected chemical reactions that results in mechanical line failure	F3	S2	D16	21X
C-2-b	WFD-23c-024	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting causes line to plug and results in mechanical line failure	F3	S2	D02	21X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

EN	Item ID	Location	Hazardous Condition	Failure Point	Failure Cause	Failure Type	Failure Result
C-2-b	WFD-23c-051	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug and results in mechanical line failure	F3	S2	D02 21X
C-2-b	WFD-23c-083	Transfer Line Inventory	Release of tank waste to soil and atmosphere from an underground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of the transfer line walls	F3	S2	D16 21X
C-2-b	WFD-26a-050	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	F3	S2	D02 21X
C-2-b	WFD-26a-086	Transfer Line Inventory	Release of tank waste to soil from a pool leak due to mechanical failures and misrouting	Human error; failure of flush line valves AND pressure switches from caustic additions system	F3	S2	E06 21X
C-3-b	WFD-26c-047	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting causes line to plug and results in mechanical line failure	F3	S2	D02 21X
C-2-b	WFD-26c-060	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump and results in mechanical line failure	F3	S2	D02 21X
C-2-b	WFD-26c-084	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Pump speed setting too high causes mechanical line failure due to increased erosion of transfer line walls	F3	S2	D12 21X
C-2-b	WFD-26c-089	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Waste rheology not as expected causes mechanical line failure due to increased erosion of transfer line walls	F3	S2	D02 21X
C-2-b	WFD-32c-042	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste	Small transfer line leak	F3	S2	D12 21X
C-2-b	WFD-32c-005	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste	Transfer line leak	F3	S2	D12 21X
C-2-b	WFD-35a-009	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line causes mechanical line failure	F3	S2	D02 21X
C-2-b	WFD-35a-068	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer causes line to plug and results in mechanical line failure	F3	S2	D02 21X
C-1-a	WFD-35d-087	Transfer Line Inventory	Release of tank waste to atmosphere from an aboveground spray leak from a failed (existing) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	F2	S3	D12 21X
C-1-a	WFD-35d-091	Transfer Line Inventory	Release of tank waste to soil from an aboveground spray leak from a failed (new) transfer line	Waste rheology not as expected which causes mechanical failure of the transfer line due to increased erosion of the transfer line walls	F2	S3	D12 21X
C-2-b	WFD-41a-014	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition causes line to plug and results in mechanical line failure	F3	S2	D02 21X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BN	Item ID	Material	Process	Hazardous Condition	Failure Cause	Failure Type	Failure Result	Failure Impact
ANALYZED ACCIDENT: Mixing of Incompatible Material - Toxic Vapor Generation								
FSAR Section 3.3.2.4.1. <i>Mixing of Incompatible Material - Toxic Vapor Generation</i>								
C-1-a XS-26-PRESXS-26-TEMP DST vapor/aerosols Release of toxic vapors from Tank 241-SY-102 due to chemical reaction Mistransfer of incompatible waste causes chemical reaction F3 S2 E06 23								
B-1-a	WFD-03a-103	Diluent System Inventory	Release of toxic vapors from diluent system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	S2	D16	23X
B-1-a	WFD-17a-103	Diluent System Inventory	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	S2	D02	23X
C-3-b	WFD-35a-103	Diluent System Inventory	Release of toxic vapors to atmosphere from diluent addition system due to unexpected chemical reactions	Mislabeled chemical used for supply of diluent, human error results in unexpected chemical reactions	F3	S2	D16	23X
HAZARDOUS CONDITIONS								
C-2-b	W058-PRES01	Amount of slurry transferred (20,000 to 1,000,000 gallons)	Release of radioactive slurry to the soil surface from overflow in the SY-A or SY-B valve pit due to piping system leak (pool)	ANALYZED ACCIDENT: Surface Leak Resulting in Pool	FSAR Section 3.4.2.7, <i>Surface Leak Resulting in Pool</i>	Water hammer plus mitigative features failure	F3	S2
C-2-b	WFD-03a-074	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	HAZARDOUS CONDITIONS	Equipment malfunction during diluent addition leads to overfilling of waste tank	Equipment malfunction during diluent addition leads to overfilling of waste tank	F1	S2
C-2-b	WFD-03a-076	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting		Procedural/human error during diluent addition leads to overfilling of waste tank	Procedural/human error during diluent addition leads to overfilling of waste tank	F1	S2
C-2-b	WFD-03a-086	Transfer Line Inventory	Release of Tank Waste to the soil from the Diluent Addition system due to failure of valves and pressure switches in the diluent addition system flush line while the transfer pump is operating		Human error	Human error	F3	S2
C-1-a	WFD-03d-007	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to misrouting		Misrouting into a structure leads to overfilling structure	Misrouting into a structure leads to overfilling structure	F3	S3
C-2-b	WFD-03d-053	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste		Transfer line valve failures/misrouting	Transfer line valve failures/misrouting	F3	S2
C-2-b	WFD-03e-012	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting		Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage leads to overfilling of waste tank	Misrouted diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage leads to overfilling of waste tank	F2	S2
C-1-a	WFD-03e-015	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to misrouting		Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste	F3	S3
C-2-b	WFD-03e-021	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting		Misrouting of simultaneous transfer or flush, inleakage, and an extended transfer duration causes overfilling intermediate waste feed tank	Misrouting of simultaneous transfer or flush, inleakage, and an extended transfer duration causes overfilling intermediate waste feed tank	F3	S2

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BRN	Item ID	Material Risk	Hazardous Conditions	Event Rank	Conc. Rank	Event ID	
C-2-b	WFD-04a-003	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling designation tank	F3	S2	E06 26X
C-2-b	WFD-04a-010	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation results in overfilling waste feed tank	F3	S2	E06 26X
C-2-b	WFD-04a-012	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	F3	S2	E06 26X
C-2-b	WFD-09c-006	Transfer Line Inventory	Release of tank waste to soil from a pool leak of waste due to misrouting	Misrouting	F3	S2	E06 26X
C-2-b	WFD-17a-074	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction during diluent addition leads to overfilling of waste tank	F1	S2	E06 26X
C-2-b	WFD-17a-076	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Procedural/human error during diluent addition leads to overfilling of waste tank	F1	S2	E06 26X
C-2-b	WFD-20a-008	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting of diluent results in overfilling destination waste tank	F3	S2	E06 26X
C-2-b	WFD-20a-010	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling waste tank	F3	S2	E06 26X
C-2-b	WFD-20a-012	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling waste tank	F3	S2	E06 26X
C-2-b	WFD-23c-006	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Misrouting	F3	S2	E06 26X
C-1-a	WFD-26c-002	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting caused by human error or mechanical malfunction that results in the structure overfilling with tank waste and produces a leak	F3	S3	E06 26X
C-2-b	WFD-29a-010	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Human error in diluent system operation leads to overfilling of waste tank	F3	S2	E06 26X
C-2-b	WFD-29a-012	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	Equipment malfunction leads to overfilling of waste tank	F3	S2	E06 26X
C-2-b	WFD-32c-001	Transfer Line Inventory	Release of tank waste to atmosphere from a pool leak due to mechanical failures and misrouting	Misrouting: Human error or mechanical malfunction	F3	S2	E06 26X
C-1-a	WFD-35d-007	Transfer Line Inventory	Release of tank waste to atmosphere from a spray leak due to mechanical failures and misrouting	Misrouting results in the structure over filling with tank waste and produces a leak	F3	S3	E06 26X
C-2-b	WFD-35e-012	Transfer Line Inventory	Release of tank waste to the soil due to a pool leak due to a misrouting	MisROUTED diluent, mismatched diluent and pump flows, misrouting of simultaneous transfer or flush, inleakage leads to overfilling of waste tank	F2	S2	E06 26X
C-1-a	WFD-35f-015	Transfer Line Inventory	Release of tank waste to soil and atmosphere from a spray leak of waste	MisROUTING caused by human error or mechanical malfunction that results in the structure over filling and produces a leak	F3	S3	E06 26X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Material/Type	Location	Represented Conditions	Event Type	Prob.	Cause GPR	Rep. GPR
ANALYZED ACCIDENT: Subsurface Leak Remaining Subsurface								
FSAR Section 3.3.2.4.7. Subsurface Leak Remaining Subsurface								
B-3-b	102S-01.b3	Radioactive/hazardous material contained in pumpable liquids from Tank 241-S-102.		Radioactive liquid released to the soil subsurface from leaks in transfer lines SI-140, SN-242. (Plume)	Line leak during saltwell pumping (corrosion)	F3	S2	D12
								29
HAZARDOUS CONDITIONS								
C-3-b	WFD-02a-006	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Solids settle in tank less quickly than anticipated	F3	S2	D02
C-3-b	WFD-02a-010	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Solids settle in tank less quickly than anticipated	F3	S2	D02
C-3-b	WFD-03a-004	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Plugging/freezing of diluent line	F3	S2	D02
C-3-b	WFD-03a-008	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Plugging/freezing of diluent line	F3	S2	D02
C-3-b	WFD-03a-013	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction in startup of diluent addition	F3	S2	D02
C-2-b	WFD-03a-017	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F3	S2	D02
C-3-b	WFD-03a-022	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F3	S2	D02
C-3-b	WFD-03a-026	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F3	S2	D02
C-3-b	WFD-03a-035	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F3	S2	D02
C-2-b	WFD-03a-040	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Restriction in diluent line	F3	S2	D02
C-3-b	WFD-03a-044	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Restriction in diluent line	F3	S2	D02
C-3-b	WFD-03a-053	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction in startup of diluent addition	F3	S2	D02
C-3-b	WFD-03a-067	Transfer Line Inventory		Release of tank waste to soil from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F3	S2	D02
C-3-b	WFD-03a-071	Transfer Line Inventory		Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	S2	D02
C-3-b	WFD-03a-092	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak of waste from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	S2	D16
C-2-b	WFD-03a-096	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak of waste from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	S2	D16
C-3-b	WFD-03c-012	Transfer Line Inventory		Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Transfer piping at lower temperature than supernate	F3	S2	D02

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BN	Item ID	Material	Accident	Hazardous Conditions	Fragile Fragile Fragile	Cause Cause Cause	Rep. Rep. Rep.
C-3-b	WFD-03e-016	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F3	S2	D02 29X
C-3-b	WFD-03d-011	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	F3	S2	D02 29X
C-3-b	WFD-03d-015	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Equipment malfunction	F3	S2	D02 29X
C-3-b	WFD-03d-023	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Incorrect transfer pump speed setting	F3	S2	D02 29X
C-3-b	WFD-03d-027	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Incorrect transfer pump speed setting	F3	S2	D02 29X
C-2-b	WFD-03d-035	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Small transfer line leak	F3	S2	D02 29X
C-3-b	WFD-03d-039	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Small transfer line leak	F3	S2	D02 29X
C-3-b	WFD-03d-046	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Transfer line valve failures/misrouting	F3	S2	D02 29X
C-3-b	WFD-03d-050	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer line valve failures/misrouting	F3	S2	D02 29X
C-2-b	WFD-03d-059	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Line pluggage leading to deadheading of the pump	F3	S2	D02 29X
C-3-b	WFD-03d-063	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Line pluggage leading to deadheading of the pump	F3	S2	D02 29X
C-3-b	WFD-03d-067	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Valve closure	F3	S2	D02 29X
C-3-b	WFD-03d-071	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Valve closure	F3	S2	D02 29X
C-3-b	WFD-03d-079	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Pump speed setting too high	F3	S2	D12 29X
C-3-b	WFD-03d-083	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Pump speed setting too high	F3	S2	D12 29X
C-3-b	WFD-03d-088	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	S2	D12 29X
C-3-b	WFD-03d-092	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	S2	D12 29X
C-3-b	WFD-03d-097	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	S2	D02 29X
C-3-b	WFD-03d-101	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	S2	D02 29X
C-3-b	WFD-03d-105	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	S2	D02 29X
C-3-b	WFD-03d-109	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	S2	D02 29X

Table C-8. Analyzed Accidents and the Represented Hazardous Conditions. (21 Sheets)

BIN	Item ID	Vessel/Unit	Initial Hazardous Condition	Final Hazardous Condition	Root Cause	Control Point	Reported Action
C-3-b	WFD-03f-008	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	S2	D02 29X
C-3-b	WFD-03f-012	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	S2	D02 29X
C-3-b	WFD-09a-031	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to not add diluent to a particular transfer	F3	S2	D02 29X
C-2-b	WFD-09a-072	Transfer Line Inventory	Release of tank waste to soil from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	S2	D02 29X
C-3-b	WFD-09b-018	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed transfer line	Transfer piping at lower temperature than supernate	F3	S2	D12 29X
C-3-b	WFD-09c-109	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Waste rheology not as expected	F3	S2	D02 29X
C-3-b	WFD-15e-012	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	S2	D02 29X
C-3-b	WFD-17a-022	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Procedural/human error in startup of diluent addition	F3	S2	D02 29X
C-3-b	WFD-17a-067	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Decision to minimize diluent addition to a particular transfer	F3	S2	D02 29X
C-3-b	WFD-17a-071	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to minimize diluent addition to a particular transfer	F3	S2	D02 29X
C-3-b	WFD-17a-092	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	S2	D16 29X
C-3-b	WFD-17a-096	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Mislabeled chemical used for supply of diluent, human error	F3	S2	D16 29X
C-3-b	WFD-17c-011	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Equipment malfunction	F3	S2	D02 29X
C-3-b	WFD-17f-008	Transfer Line Inventory	Release of tank waste to soil from an aboveground pool leak from a failed (existing) transfer line	Possible dissolution of previously unidentified solids in receiving tank (e.g., phosphate ring)	F3	S2	D02 29X
C-3-b	WFD-26b-018	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Transfer piping at lower temperature than supernate	F3	S2	D02 29X
C-3-b	WFD-26c-083	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Pump speed setting too high	F3	S2	D12 29X
C-3-b	WFD-26c-088	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (existing) transfer line	Waste rheology not as expected	F3	S2	D02 29X
C-3-b	WFD-32a-035	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Decision to not add diluent to a particular transfer	F3	S2	D02 29X
C-2-b	WFD-32a-062	Transfer Line Inventory	Release of tank waste to soil from an underground pool leak from a failed (new) transfer line	Procedural/human error in startup of diluent addition	F3	S2	D02 29X

This page intentionally left blank.

Appendix D

Peer Review Checklist

This page intentionally left blank.

Technical Peer Review Checklist

Practice 134 290 1112
 Publication Date 22Nov99
 Attachment 02 - Sheet 1 of 1

FLUOR DANIEL NORTHWEST

TECHNICAL PEER REVIEWS

CHECKLIST FOR TECHNICAL PEER REVIEW

Document Reviewed: RPP-5914 Rev Ø
 Title: HAZARD EVALUATION FOR WASTE FRED DELIVERY OPERATIONS AND ACTIVITIES
 Author: GRANT RYAN
 Date: 3/7/00
 Scope of Review: DOCUMENT & TABLES - ACCURACY & COMPLETENESS

Yes	No*	NA**	
[✓]		**	Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
[✓]			Problem completely defined.
[]		✓	Accident scenarios developed in a clear and logical manner.
[✓]			Necessary assumptions explicitly stated and supported.
[]		✓	Computer codes and data files documented.
[]		✓	Data used in calculations explicitly stated in document.
[✓]			Data checked for consistency with original source information as applicable.
[]		✓	Mathematical derivations checked including dimensional consistency of results.
[]		✓	Models appropriate and used within range of validity, or use outside range of established validity justified.
[]		✓	Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
[]		✓	Software input correct and consistent with document reviewed.
[]		✓	Software output consistent with input and with results reported in document reviewed.
[]		✓	Limits/criteria/guidelines applied to analysis results are appropriate and referenced.
[]		✓	Limits/criteria/guidelines checked against references.
[]		✓	Safety margins consistent with good engineering practices.
[✓]			Conclusions consistent with analytical results and applicable limits.
[✓]			Results and conclusions address all points required in the problem statement.
[✓]			Format consistent with applicable guides or other standards.
[]		✓**	Review calculations, comments, and/or notes are attached. - Editorial Comments only
[✓]			Document approved (for example, the reviewer affirms the technical accuracy of the document).

MILTON V. SHULTE

Reviewer (printed name and signature)

3/7/00

Date

* All "no" responses must be explained below or on an additional sheet.

** Any calculations, comments, or notes generated as part of this review should be signed, dated, and attached to this checklist. The material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party.

This page intentionally left blank.

DISTRIBUTION SHEET