Sta. 4

JUN 30 2003

ENGINEERING DATA TRANSMITTAL

1. EDT 637230

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Engineering Standards	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: RPP/ENG/Eng.Serv/Eng.Stndards	6. Design Authority/Design Agent/Cog. Engr.: M.A. Knight	7. Purchase Order No.: N/A
8. Originator Remarks: This document is being released into the supporting document system for retrievability purposes.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
		12. Major Assm. Dwg. No.: N/A
11. Receiver Remarks:	11A. Design Baseline Document? ☐ Yes ☒ No	13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	RPP-16760	N/A	0	Engineering Specialty	N/A	2	1	
				Assessment of Tank Waste				
				Compatibility Reporting				

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	D.C. Lowe		6/30/03	R2-58
		Design Agent				1	1	J. Templeton		6/30/03	R1-14
1	1	Cog. Eng. M.A. Knight		6/30/03	R1-14						
1	1	Cog. Mgr. for M.A. Fish		6/30/03	R1-14						
		QA									
		Safety									
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
M.A. Knight 6/30/03 Signature of EDT Originator / Date	Authorized Representative for Receiving Organization / Date	for M.A. Fish 6/30/03 Design Authority/ Cognizant Manager / Date	Ctrl No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments

BD-7400-172-2 (10/97)

BD-7400-172-1

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Engineering Standards	Date 6/30/2003
Project Title/Work Order		EDT No. 637230
RPP-16760, Engineering Specialty Assessment of Tank Waste Compatibility Reporting		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
C.E. Anderson	R2-58	x			
C. Defigh-Price	R2-58	x			
G.L. Faust	R1-31	x			
M.A. Fish	R1-14	x			
K.D. Fowler	S5-13	x			
T.M. Horner	S5-13	x			
N.W. Kirch	R1-44	x			
M.A. Knight	R1-14	x			
J.A. Lechelt	S5-13	x			
D.C. Lowe	R2-58	x			
P.C. Miller	R1-51	x			
C.H. Mulkey	R1-51	x			
T.C. Oten	S5-07	x			

Engineering Specialty Assessment of Tank Waste Compatibility Reporting

BEST AVAILABLE COPY

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

EDT/ECN: 637230 UC:
Cost Center: 7G110 Charge Code: 113710
B&R Code: Total Pages: ~~94~~ 95
CLC 6-30-03

Key Words: Assessment, Compatibility, Waste, Engineering Assessment, 2003-ENG-S-0044, HNF-SD-WM-OCD-015

Abstract: Engineering Specialty Assessment of the Tank Waste Transfer Compatibility Program, HNF-SD-WM-OCD-015, was conducted during June 2003 to identify areas for improvement and streamlining to support accelerated retrieval and closure and Waste Feed Delivery.

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.

JUN 30 2003
DATE:
STA: 4
HANFORD RELEASE
ID: 21

6/30/03
Release Approval Date Release Stamp

Approved For Public Release

RPP-16760
Revision 0

ENGINEERING SPECIALTY ASSESSMENT OF TANK WASTE COMPATIBILITY REPORTING

M.A. Knight
CH2M HILL Hanford Group, Inc.

Date Published
June 2003

CH2MHILL
Hanford Group, Inc.
Post Office Box 1500
Richland, Washington

Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-99RL14047

Approved for Public Release; Further Dissemination Unlimited

Executive Summary

This Engineering Specialty Assessment was conducted to review the Tank Farm Waste Transfer Compatibility Program to assess whether the program meets the needs of accelerated retrieval and closure and waste feed delivery and to identify areas and methods for streamlining the program. The assessment was conducted in June 2003 and resulted in two findings and thirteen observations.

The assessment results indicate that significant opportunities exist for streamlining the program by reducing the number of criteria requiring evaluation from 21 to 11, with only six of the criteria requiring evaluation for the majority of transfers. The assessment identified areas where existing criteria require strengthening to ensure that the risks of undesirable solids precipitation, from either waste mixing or waste transfer, are minimized. The assessment further identified opportunities for using existing engineering tools to simplify the calculations involved with preparation of waste compatibility assessments. The need to ensure that a revision to the waste compatibility program is prepared to align the program criteria with those that will be implemented with the DSA approval was also identified. Finally, the assessment identified that corrective actions are required to implement a tank-by-tank PCB inventory within the Best Basis Inventory and to ensure that sample data from external waste generators is entered into the TWINS database.

<u>The findings and observations of this assessment are:</u>

F-1 A PCB Inventory is not currently being maintained in TWINS as agreed to with ORP, Ecology, and EPA in RPP-6623, *Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System.*

F-2 Sample data from external waste generators is not currently entered into TWINS or the BBI.

O-1 The use of a single waste compatibility compliance table and corresponding calculations for all types of transfers requires assessment of several non-applicable criteria for the majority of transfers and results in unnecessary paperwork being generated.

O-2 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, requires revision as part of the DSA implementation to revise the current program criteria for Criticality, Radiological and Toxicological Source Term, Bulk Chemical Runaway, Time to Lower Flammable Limit, Flammable Gas, pH for DST additions, and DST Waste Chemistry to reflect controls required by the DSA.

O-3 The use of a Waste Stream Profile Sheet as specified in the Double-Shell Tank Waste Analysis Plan adds unnecessary paperwork and time to preparation of compatibility assessments and is not required to meet WAC-173-303.

O-4 RPP-6623, *Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System*, requires sampling for PCBs and assessment of receiver tank concentrations of PCBs for every transfer; although virtually all data indicate concentrations are below limits of detection or are at concentrations that are not capable of exceeding limits.

O-5 Criteria for DCRT Waste Chemistry contained in OSD-T-151-00011, *Operating Specifications for Active Double Contained Receiver Tanks*, and AWF Waste Chemistry contained in OSD-T-151-00007, *Operating Specifications for Double-Shell Storage Tanks*, should be removed from the OSDs and compatibility program.

O-6 The DSA time to LFL criteria may only be able to be exceeded for a limited number of transfers/conditions that could be pre-screened as part of DSA implementation rather than evaluated for every transfer using the compatibility program.

O-7 The basis for the phosphate waste rule contained in the compatibility program is unclear. Its basis should be underpinned and incorporated in a revised chemical compatibility criterion.

O-8 The rules for Organic and Energetic Reactions and Heat Generation Rate, contained in the compatibility program, require further evaluation to determine whether they are still required or whether they can be removed from the program.

O-9 The Waste Envelope, Waste Feed Delivery Configuration Control, and Waste Segregation criteria should be removed from the compatibility program and they should be evaluated instead using HTWOS as part of the annual TFCOUP update.

O-10 The Line Plugging criterion in the compatibility program needs refinement to address more fully the risks of precipitation during waste transfer and to incorporate dilution recommendations currently provided in separate Process Memos.

O-11 HTWOS may be able to perform mass balance calculations in support of compatibility assessments more efficiently than the spreadsheets used currently.

O-12 The spreadsheets currently used to perform compatibility assessments need to be simplified and documented so that: i) the amount of paperwork included in compatibility assessments is reduced and ii) the waste compatibility compliance table is automatically completed.

O-13 Tank Farms Waste Acceptance Criteria contained in RPP-10726, *Requirements for Discharge from Non-Tank Farm Waste Generators into DST System*, have not been formally transmitted to external waste generators.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 BACKGROUND 1
1.2 PURPOSE OF THE ASSESSMENT 2
1.3 REVIEW PROCESS AND METHODOLOGY 2

2.0 ASSESSMENT RESULTS 3
2.1 SUMMARY OF RESULTS 3
2.2 DESCRIPTION OF RESULTS 3
2.3 FINDINGS AND OBSERVATIONS 5

3.0 CONCLUSION 7

APPENDICIES

A – COMPLETED CRADS A-1
CRAD 1 ..... A-2
CRAD 2 ..... A-5
CRAD 3 ..... A-13

B – DOCUMENT REVIEWS B-1
PROGRAM CRITERIA ASSESSMENT REVIEWS B-2
CRITERIA IMPLEMENTATION REVIEWS B-27
CONSOLIDATED INTERVIEW RESPONSES B-46

C – PER SUMMARY C-1

D – ASSESSMENT PLAN D-1

E - TEAM MEMBER QUALIFICATIONS E-1

LIST OF TABLES

Table 1 – Proposed Streamlined Waste Compatibility Program Criteria 3
Table B-1 – CRAD 1 Document Review List B-2
Table B-2 – Program Criteria Summary Results B-4
Table B-3 – CRAD 2 Document Review List B-27
Table B-4 – Consolidated Interview Responses B-46
Table C-1 – Summary of Compatibility Assessment PERs C-2

LIST OF TERMS

CH2M HILL	CH2M HILL Hanford Group, Inc.
CRAD	Criteria Review and Approaches Document
DOE	U.S. Department of Energy
DQO	data quality objective(s)
DSA	Documented Safety Analysis
DST	Double-Shell Tank
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HTWOS	Hanford Tank Waste Operations Simulator
LFL	Lower Flammable Limit
OSD	Operating Specifications Document
ORP	U.S. Department of Energy, Office of River Protection
PER	Problem Evaluation Request
PCB	Polychlorinated Biphenyl
SST	Single-Shell Tank
TFCOUP	*Tank Farm Contractor Operations and Utilization Plan*
TSR	*Tank Farms Technical Safety Requirements*
WAP	Waste Analysis Plan
WSPS	Waste Stream Profile Sheets

1.0 INTRODUCTION

1.1 BACKGROUND

CH2M HILL Hanford Group, Inc. (CH2M HILL) operates the Hanford waste tank farm facilities for the Department of Energy (DOE), Office of River Protection (ORP). This includes providing the engineering program for the tank farm facilities including Waste Feed Delivery to the Waste Vitrification Plant and Closure of the single shell waste tanks.

The Tank Farm Waste Transfer Compatibility Program is documented in HNF-SD-WM-OCD-015 and is implemented to help assure continued safe and prudent storage and handling of wastes within the Tank Farms Facility. The program provides a series of decision rules for waste transfers within and for receipt of waste and chemicals into the Tank Farms Double-Shell Tank System. These decision rules address safety, operational, regulatory, and programmatic criteria and specify the considerations necessary to assess waste transfers and chemical additions.

The program only assesses requirements and limits affected by the transfer or receipt of waste or chemicals that are dependent on the chemical composition or properties of the waste. Requirements for tank piping, leak detection, ventilation systems, and physical system requirements are not included in the program since they are controlled by other administrative procedures and control documents.

The Tank Farm Waste Compatibility Program was originally developed in 1991, prior to much of the extensive waste characterization and testing of Hanford wastes that has occurred in response to development of resolutions to the safety issues associated with the watch list tanks. The original program contained fewer specific rules than the current program and relied on characterization, testing, and independent technical review of compatibility/safety issues as appropriate to ensure chemical compatibility of waste streams. Many of the original rules are still contained within the program, although in cases the basis may have been somewhat lost, new rules have been added, particularly in the environmental and safety areas, and in general, more formal calculation procedural requirements have been applied to the documents. These changes have caused the documents to grow in volume and perceived complexity and the continued need for some of the current rules has not been challenged or reviewed for some time.

As a result of these issues, Engineering Improvement Plan Action 4a,"Waste Compatibility Analysis -- streamline process to reduce time and resource by 75%," was established to look for ways of improving the process of preparing waste compatibility assessments.

This assessment was a scheduled engineering specialty assessment of the waste compatibility reporting process (2003-ENG-S-0044) and was conducted by CH2M HILL engineering personnel in June 2003 in accordance with the *Management Assessment Procedure* (TFC-ESHQ-AP-C-01).

1.2 PURPOSE OF THE ASSESSMENT

The purpose of this Engineering Specialty Assessment was to review the Tank Farm Waste Transfer Compatibility Program to assess whether the program meets the needs of accelerated retrieval and closure and waste feed delivery and to identify areas and methods for streamlining the program.

The results of the assessment will be used as input to the completion of the Engineering Improvement Plan action to streamline the waste compatibility assessment process.

1.3 REVIEW PROCESS AND METHODOLOGY

The assessment was conducted in accordance with a management approved assessment plan (Appendix D). Three Criteria Review and Approaches Documents (CRAD) are contained within the plan that provide details of how the assessment will be conducted. The assessment included reviews of compatibility assessment documents, the waste compatibility program document, numerous source documents for the program criteria, interviews with personnel involved with or familiar with the compatibility program to identify areas for improvement, and review of related Problem Evaluation Requests (PERS). The assessment did not include assessment of field activities.

The assessment reviewed 22 waste compatibility assessments covering various types of transfers. These documents were reviewed to determine the extent of applicability of the criteria to the various types of transfer and the degree to which dispositions to the criteria were required. This review was conducted in accordance with CRAD 1, with an aim of identifying criteria that may not be required.

In addition, 24 requirements source documents were reviewed associated with the majority of the compatibility criteria. These documents were reviewed to determine the validity of the criteria, whether the criteria were current, whether criteria would be eliminated in the Documented Safety Analysis (DSA), whether the method of implementation was overly prescriptive relative to the original source requirement, and whether source documents could/should be revised to remove outdated criteria. This review was conducted in accordance with CRAD 2, again with an aim of identifying areas for streamlining.

Finally, discussions and interviews were held with 13 personnel involved with or familiar with aspects of the compatibility program including 4 Managers and 9 Engineers to identify any further areas for improvement or address issues identified in CRAD1 and 2. These interviews were conducted in accordance with CRAD3.

The assessment team consisted of the Process/Chemical Engineering Discipline Lead from the CH2M HILL Engineering Standards organization, supplemented by a summer intern Engineering student. Identification of the team members and their qualifications are provided in Appendix E.

2.0 ASSESSMENT RESULTS

2.1 SUMMARY OF RESULTS

This assessment identified that there are significant opportunities for streamlining the Tank Farms Waste Transfer Compatibility Program, HNF-SD-WM-OCD-015, by removing criteria that are no longer required because either they have become outdated, or they are better evaluated using other tools or systems, or because the basis documents that require their evaluation can be revised to remove the criteria. Twenty-One (21) criteria are currently evaluated in waste compatibility assessments for every transfer. If all the recommendations of this assessment can be successfully implemented, the total number of criteria requiring assessment would be reduced to eleven (11), with only six (6) of those criteria requiring assessment for intra-tank farm transfers. The proposed revised criteria for external and internal transfers are summarized in Table 1 below.

Table 1 – Proposed Streamlined Waste Compatibility Program Criteria

Criteria Number	Criteria	Transfers from External Waste Generators	Intra-Tank Farm Transfers and Chemical Additions
1.	Criticality	•	
2.	Radiological Source Term (Liquids)	•	
3.	Radiological Source Term (Solids)	•	
4.	Toxicological Source Term	•	
5.	PCBs	•	
6.	pH of DST additions	•	•
7.	Time from 25% to 100% of LFL	•	•
8.	Flammable Gas	•	•
9.	DST Chemistry Control	•	•
10.	Chemical Compatibility	•	•
11.	Line Plugging	•	•

The successful implementation of the recommendations of this assessment will require the involvement and cooperation of groups outside of Engineering, particularly Environmental, who are responsible for requirement documents that would require revision.

2.2 DESCRIPTION OF RESULTS

A detailed description of the assessment results is provided in the CRADs in Appendix A and on document review sheets contained in Appendix B.

A review of completed compatibility assessments, performed in CRAD 1, indicated that 9 of 21 assessed criteria were only applicable to a limited number of transfers and yet were evaluated for all transfers and included in the assessment reports, adding unnecessary time and paperwork to preparation of these documents. 3 criteria typically required disposition indicating that they were important criteria to be retained. 8 criteria required further assessment to determine their continued need.

Review of the source documents for the compatibility program, conducted in CRAD 2, identified eight (8) criteria that should be eliminated from the program. These are:

- Bulk Chemical Runaway
- DCRT Corrosion Control
- Current Waste Stream Profile Sheet
- Chemical Compatibility (based on reactivity groups)
- Waste Feed Envelope
- WFD Configuration Control
- AWF Waste Chemistry
- Waste Segregation

Further evaluation is required to determine the need for the Organic and Energetic Reaction and the Heat Generation Rate criteria. Preliminary reviews indicated that these criteria might also be able to be removed from the program, further reducing the total criteria requiring assessment.

The review also identified that significant changes in the PCB Management criterion should be implemented that would only require this to be assessed (in a more limited way) for receipts from external waste generators.

The Phosphate Waste Rule requires further evaluation to verify its validity and it should be incorporated into a more generalized chemical compatibility criterion that considers the risk of precipitation of multiple components including phosphate, aluminum, and carbonate.

Further evaluation using the methodology of RPP-5926 may be able to reduce the number of transfers that require routine evaluation of Time from 25% to 100% of Lower Flammable Limit (LFL) to meet the DSA requirements.

Criticality, Radiological (DST Liquids and DST Solids) and Toxic Source Term, Flammable Gas, pH of DST additions, DST Chemistry Control, and Line Plugging are required criteria that need to be retained in the program.

Implementation of these changes will require the cooperation of the Environmental group to revise the *Double-Shell Tank Waste Analysis Plan*, HNF-SD-WM-EV-053, and RPP-6623, *Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System*. Other source documents such as the Operating Specifications Documents will also require revision to remove requirements. Waste envelope, waste feed delivery configuration control, and waste segregation will require evaluation as part of the TFCOUP.

Interviews conducted as part of CRAD 3 identified that the tank farm flow sheet model HTWOS might be able to perform mass balance calculations in support of compatibility assessments more efficiently than the spreadsheets used currently. It was further identified that sample data reported by external waste generators is not currently included in TWINS.

2.3 FINDINGS AND OBSERVATIONS

The findings, observations, and assigned Problem Evaluation Requests (PERs) that resulted from this assessment are:

F-1 A PCB Inventory is not currently being maintained in TWINS as agreed to with ORP, Ecology, and EPA in RPP-6623, *Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System.* (PER-2003-2482)

F-2 Sample data from external waste generators is not currently entered into TWINS or the BBI. (PER-2003-2483)

O-1 The use of a single waste compatibility compliance table and corresponding calculations for all types of transfers requires assessment of several non-applicable criteria for the majority of transfers and results in unnecessary paperwork being generated. (PER-2003-2484)

O-2 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, requires revision as part of the DSA implementation to revise the current program criteria for Criticality, Radiological and Toxicological Source Term, Bulk Chemical Runaway, Time to Lower Flammable Limit, Flammable Gas, pH for DST additions, and DST Waste Chemistry to reflect controls required by the DSA. (PER-2003-2485)

O-3 The use of a Waste Stream Profile Sheet as specified in the Double-Shell Tank Waste Analysis Plan adds unnecessary paperwork and time to preparation of compatibility assessments and is not required to meet WAC-173-303. (PER-2003-2486)

O-4 RPP-6623, *Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System*, requires sampling for PCBs and assessment of receiver tank concentrations of PCBs for every transfer; although virtually all data indicate concentrations are below limits of detection or are at concentrations that are not capable of exceeding limits. (PER-2003-2487)

O-5 Criteria for DCRT Waste Chemistry contained in OSD-T-151-00011, *Operating Specifications for Active Double Contained Receiver Tanks*, and AWF Waste Chemistry contained in OSD-T-151-00007, *Operating Specifications for Double-Shell Storage Tanks*, should be removed from the OSDs and compatibility program. (PER-2003-2488)

O-6 The DSA time to LFL criteria may only be able to be exceeded for a limited number of transfers/conditions that could be pre-screened as part of DSA implementation rather than evaluated for every transfer using the compatibility program. (PER-2003-2489)

O-7 The basis for the phosphate waste rule contained in the compatibility program is unclear. Its basis should be underpinned and incorporated in a revised chemical compatibility criterion. (PER-2003-2490)

O-8 The rules for Organic and Energetic Reactions and Heat Generation Rate, contained in the compatibility program, require further evaluation to determine whether they are still required or whether they can be removed from the program. (PER-2003-2494)

O-9 The Waste Envelope, Waste Feed Delivery Configuration Control, and Waste Segregation criteria should be removed from the compatibility program and they should be evaluated instead using HTWOS as part of the annual TFCOUP update. (PER-2003-2495)

O-10 The Line Plugging criterion in the compatibility program needs refinement to address more fully the risks of precipitation during waste transfer and to incorporate dilution recommendations currently provided in separate Process Memos. (PER-2003-2496)

O-11 HTWOS may be able to perform mass balance calculations in support of compatibility assessments more efficiently than the spreadsheets used currently. (PER-2003-2497)

O-12 The spreadsheets currently used to perform compatibility assessments need to be simplified and documented so that: i) the amount of paperwork included in compatibility assessments is reduced and ii) the waste compatibility compliance table is automatically completed. (PER-2003-2498)

O-13 Tank Farms Waste Acceptance Criteria contained in RPP-10726, *Requirements for Discharge from Non-Tank Farm Waste Generators into DST System*, have not been formally transmitted to external waste generators. (PER-2003-2499)

3.0 CONCLUSION

This specialty assessment of the tank waste compatibility reporting process resulted in two findings and thirteen observations. The assessment results indicate that significant opportunities exist for streamlining the program by reducing the number of criteria requiring evaluation from 21 to 11, with only six of the criteria requiring evaluation for the majority of transfers. The assessment identified areas where existing criteria require strengthening to ensure that the risks of undesirable solids precipitation, from either waste mixing or waste transfer, are minimized. The assessment further identified opportunities for using existing engineering tools to simplify the calculations involved with preparation of waste compatibility assessments. The need to ensure that a revision to the waste compatibility program is prepared to align the program criteria with those that will be implemented with the DSA approval was also identified. Finally, the assessment identified that corrective actions are required to implement a tank-by-tank PCB inventory within the Best Basis Inventory and to ensure that sample data from external waste generators is entered into the TWINS database.

APPENDIX A – COMPLETED CRADS

CRAD 1
Program Criteria Compliance

OBJECTIVE
Identify the degree to which program criteria are met without placing restrictions on the transfer. This review may assist in identifying criteria that would not normally require assessment or control for tank waste transfers.

Performance Criteria
1. Criteria do not apply to the reviewed transfer.
2. Criteria were met based on analytical data with no restrictions.
3. Criteria were met based on analytical data with restrictions on volumes.
4. Criteria were not met based on raw data, but a disposition was developed permitting the transfer.
5. Criteria were not met based on raw analytical data, but a chemical adjustment prior to transfer permitted the transfer to proceed.
6. Restrictions were placed on transfer that did not directly affect compliance with the criteria.

Approach
Review of a sample of compatibility assessments developed since July 1, 2002 for both tank farm and non-tank farm transfers including:
- Saltwell transfers
- DST to DST transfers
- Evaporator campaigns
- 222-S Laboratory transfers
- PFP transfers

Documentation:
Program Criteria Assessment review forms were completed for each document reviewed and are contained in Appendix B. These forms indicate for each assessment how each of the 21 compatibility program criteria were dispositioned against the 6 performance criteria provided above.

Records reviewed:
Twenty-two individual compatibility assessment documents were reviewed. The list of documents reviewed is provided in Table 2 of Appendix B.

Discussion of Results:
Table 3 of Appendix B provides a consolidated summary of the number of assessments in each of the 6 performance categories against each of the 21 program criteria. This table indicates that for more than half of the assessments reviewed 9 of the 21 criteria did not apply to the particular assessment. This is to be expected since several of the criteria; criticality, source term controls (radiological and toxic), and pH of DST additions only apply to external waste generators. Other criteria only apply to transfers involving

specific tanks; DCRT corrosion control, AWF Waste Chemistry, and WFD Configuration Control. This may indicate that there is merit in the use of different compliance tables that are dependent on the type of transfer assessed. This would reduce paperwork associated with the majority of transfers by reducing the number of criteria to be assessed and dispositioned. Of the remaining 12 criteria applicable to all types of transfer, 5 of the criteria were found to be easily met for all assessments reviewed. This may indicate that either the criteria are rarely limiting or may not need to be normally assessed. The criteria that were met for all assessments reviewed were: bulk chemical runaway, time to LFL, organic and energetic reactions, chemical compatibility, and heat generation rate. Bulk chemical runaway currently requires assessment as part of the TSR but has been shown to be incredible in the DSA and will no longer require assessment when the DSA is approved. Time to LFL also requires calculation as part of the TSR. However, the results of this assessment indicate that it may be possible to perform more bounding calculations to illustrate that only transfers involving certain wastes (specific tanks) are able to challenge the criteria, thereby reducing the number of assessments that would involve this criteria. Organic and energetic reactions, chemical compatibility, and heat generation rate require further review to assess their continued need. Three criteria were easily met for virtually all assessments reviewed or found not to be applicable, indicating that they are not limiting or beneficial. These criteria are phosphate waste, PCB management, and current Waste Stream Profile Sheet. Two criteria required dispositions to resolve them for several transfers; DCRT corrosion control and Waste Feed Envelope. The continued need for these 8 criteria is discussed further in CRAD 2. Finally, only three criteria routinely require dispositions; DST Chemistry Control, Flammable Gas, and Line Plugging: this is indicative that these are important criteria requiring assessment.

Conclusion:

9 of 21 criteria are only applicable to a limited number of transfers and yet are evaluated for all transfers and included in the assessment reports, adding unnecessary time and paperwork to preparation of these documents. 8 of 21 criteria require further assessment to determine their continued need – the majority of these criteria are discussed in CRAD 2. 3 criteria typically require disposition indicating that they are important criteria to be retained. Bulk chemical runaway should be removed from the compatibility program at the time of DSA implementation. Further evaluations should be performed to determine if bounding calculations can show that time to LFL only requires individual evaluation for a limited number of transfers.

Issue(s)

1. The use of a single compliance table and corresponding calculations for all types of transfers requires assessment of several non-applicable criteria and results in unnecessary paperwork being generated.

   Recommended Corrective Action: Separate compliance tables should be developed based on the types of transfer being assessed that contain only the applicable criteria for that transfer.

2. The bulk chemical runaway criterion is never exceeded in current assessments and is considered incredible in the DSA.

   Recommended Corrective Action: Bulk Chemical Runaway should be removed from the compatibility program at the time of DSA implementation.

3. Time to LFL is evaluated for all transfers per the TSR but was not exceeded in any assessments reviewed. This may indicate that it is not feasible to exceed the criterion for the majority of transfers.

   Recommended Corrective Action: Evaluate whether bounding calculations can be developed to demonstrate that the time to LFL criterion cannot be exceeded for the majority of transfers, thereby requiring individual assessment of this criterion for a limited number of transfers.

CRAD 2
Criteria Implementation

OBJECTIVE
Identify whether supporting and driving documents require criteria to be assessed for each transfer in the manner in which they are currently assessed. Identify whether the criteria specified in driving documents are appropriate and whether opportunities exist for eliminating criteria by revising supporting documents.

Performance Criteria
1. Criteria are taken directly from a source document that requires the criteria to be assessed for each transfer.
2. Criteria are based on a source document but method of assessment is self imposed.
3. Criteria are important operational requirements based on good engineering practice that require assessment for each transfer.
4. Criteria are unnecessary, outdated, or cannot be complied with.

Approach
The assessment will review the Tank Waste Compatibility Program and supporting documents including:
Double Shell Tank Waste Analysis Plan
Management of the PCB Inventory in the DST System
Operating Specifications Documents
AC 5.7, Nuclear Criticality Safety
AC 5.8, Source Inventory Controls
AC 5.12, Transfer Controls
AC 5.15, Corrosion Mitigation Program
WAC 173-303, Dangerous Waste Regulations

Documentation:
Criteria implementation review forms were completed for all documents reviewed and are included in Appendix B.

Records Reviewed:
24 requirement source documents were reviewed. The list of documents reviewed is provided in Table 4 of Appendix B.

Discussion of Results:
A review of requirements contained in the DST Waste Analysis Plan (WAP) and Dangerous Waste regulations, WAC-173-303, and their implementation in the compatibility program indicated the following:

1. The use of the current 7-page Waste Stream Profile Sheet (WSPS) called for by the DST WAP adds unnecessary paperwork and time to the preparation of waste compatibility assessments particularly for external transfers and is not required in order to meet the requirements of WAC 173-303.

2. Actual analytical data is currently used as the primary basis for preparing compatibility assessments from external generators, rather than concentration ranges for analytes specified on a WSPS as implied in the DST WAP. The DST WAP should be revised to rely primarily on actual analytical data for preparation of compatibility assessments, either provided by external waste generators or taken from TWINS for SSTs and 242-A. At a minimum, compositional data (sections III, IV, and V) should be removed from the WSPS and analytical data provided in laboratory reports or from TWINS used instead.
3. Consideration should be given to whether a WSPS is required at all.
4. Use of a WSPS and any associated certifications should be discontinued for transfers from SSTs and 242-A since these should not be considered external generators.
5. The WAP should be revised to extend the frequency of submission of a WSPS (if required) for current transfers from external generators (222-S, PFP, 242-A), with only a certification required that the type of waste (waste numbers etc.) has not changed from that previously provided. This certification could be provided in a letter specifying the volume of waste to be transferred either annually or with each batch – this would replace/eliminate the need to verify that analytical data matched the WSPS, since the process would be reversed.
6. Evaluation of chemical compatibility based on reactivity groups provided on WSPS should be discontinued for all current transfers.
7. Environmental should revise the DST WAP to reflect the above changes.
8. Based on changes in the DST WAP, the criteria for confirmation that a current WSPS is available and chemical compatibility (based on reactivity groups) should be removed from the compatibility program.

A review of the requirements for PCB Management and their implementation in the waste compatibility program indicated the following:

1. Sampling of liquids for PCBs should be discontinued as part of the PCB management program based on the data collected to date showing all liquid analyses are below detection limits and knowledge of the very low solubility of PCBs. This would save substantial cost for expensive analyses. This will likely require agreement of ORP and Ecology.
2. A PCB Inventory is not currently being maintained in TWINS as agreed to with ORP and Ecology in RPP-6623. The capability exists in the BBI to do this and needs to be implemented.
3. RPP-6623 should be revised to not require calculation of PCB concentrations as a criterion for evaluating Intra-Tank Farm transfers. Data collected to date indicates that, out of 1903 analyses, only one core sample from TY-106 exceeds 50 ppm PCB and that mixing any liquid wastes cannot cause the criteria to be exceeded. Checking that TY-106 is not involved in the transfer would be all that is required to determine that the limits cannot be exceeded for any tank farm transfers.
4. RPP-6623 should be revised for transfers from external generators not to require calculation of the final receiver tank concentration of PCBs under normal circumstances. Waste generators should state based on analysis of their waste that

PCB concentration is ≤ 50 ppm in solids and ≤ 2.9 ppm in liquids. With that certification, no calculations are necessary to confirm that the receiver tank cannot exceed the limits, based on the concentration of PCBs currently in Tank Farms. Only in the situation in which solids concentration was above 50 ppm but ≤ 450 ppm (which it is not clear has ever happened) would a calculation of the receiver tank concentration be required.

5. Requirements in RPP-6623 that "All other DST System waste acceptance criteria must be met as specified in [the waste compatibility program]" should be removed since this is not related to management of PCBs and unnecessarily links the entire compatibility program to PCB management.
6. Environmental and Engineering should discuss the above changes with ORP/Ecology (if required) and revise RPP-6623 accordingly.
7. Waste compatibility program should be revised to reflect approved changes to PCB management strategy.

A review of requirements derived from Operations Specifications Documents indicated the following:

1. OSD-T-151-00011, *Operating Specifications for Active Double Contained Receiver Tanks*, should be revised to either eliminate the DCRT corrosion specification or not require its evaluation as part of the waste compatibility assessment. The justifications for removing this criterion are:
    i. Transfers from external generators are already required to comply with DST chemistry specifications (which are evaluated separately and are the same as the DCRT limits).
    ii. The only other transfers through DCRTs are one remaining saltwell and occasional transfers of primarily water from catch tanks.
    iii. The DCRTs are scheduled to be removed from service by June 30, 2005 under milestone M48-7.
2. OSD-T-151-00007, *Operating Specifications for Double-Shell Tanks*, should be revised to remove the AWF Waste Chemistry Criteria. This criterion is outdated and was established when the tanks received fresh aging waste and was intended to prevent solids precipitation that could lead to heat build-up and tank bumps. The wastes have cooled considerably, significant volumes of solids are already present in the tanks, past work has shown that precipitation would occur at a significantly higher concentration than set by this current limit, and other criteria should evaluate the risk/consequences of solids precipitation for all tank transfers.
3. Waste compatibility program should be revised to remove the DCRT corrosion specification and AWF Waste Chemistry criteria to reflect changes in the corresponding OSDs.

A review of AC 5.12, Transfer Controls, indicated the following:

1. As part of DSA implementation, remove criteria for chemical runaway from the waste compatibility program.
2. The waste compatibility program should be revised to reflect the DSA criteria for evaluating time to LFL.
3. Perform additional calculations based on the methodology of RPP-5926 to determine the feasibility of establishing bounding limits or waste tank groupings to identify only those wastes/conditions that are able to challenge the DSA time to LFL criteria and thereby reduce the number of transfers that require this criterion to be evaluated as part of the waste compatibility assessment.

A review of the source documents for the phosphate waste rule was conducted and indicated:

1. The source documents that are stated in the waste compatibility program to provide the basis for the current phosphate solubility rule do not provide an adequate basis for the rule. Other documentation was reviewed that provides better support for concerns with phosphate precipitation but still may not fully support the rule in its current form. Other documentation exists concerning phosphate solubility and needs further review to determine whether the rule is valid in its current form or whether an alternate rule is appropriate that may better apply to SST retrieval and solids transfers.
2. If the rule is deemed valid, then existing analytical data indicates it cannot be exceeded for liquid transfers within the DST system and it should not require evaluation for those transfers.
3. The current rule only considers the potential for phosphate precipitation from mixing wastes. An alternate chemical compatibility criteria should be developed to replace the phosphate rule that fully considers potential precipitation of solids including phosphate, aluminum, and carbonate from mixing or evaporating wastes. It may be possible to combine this with the line plugging criteria.

The basis for the Waste feed Envelope, Waste Feed Delivery Configuration Control, and Waste Segregation criteria was reviewed and indicated:

1. The waste envelope criterion in the program currently only checks for three components for envelope A. The intent is to avoid making envelope C to the extent practical. However, it does not avoid making envelope B, which would have implications on glass volumes. Overall, the criterion serves little purpose as structured. Waste envelopes are currently checked as part of the annual revision to the Tank Farm Contractor Operations and Utilization Plan (TFCOUP) using the Hanford Tank Waste Operations Simulator (HTWOS). This is the more appropriate tool to evaluate waste envelopes well ahead of the time of a transfer. HTWOS is able to evaluate all envelopes and assess alternate transfers to resolve issues.

2. The restriction on waste transfers into tanks placed under configuration control for Waste Feed Delivery is also better controlled during the up-front planning process for transfers as part of the TFCOUP.
3. Waste segregation (i.e. complexed from non-complexed and TRU from non-TRU) is also better evaluated as part of the TFCOUP and planning process for transfers rather than at the time of transfer.
4. The criteria of Waste Envelope and Waste Segregation should be removed from the compatibility program and evaluated as part of the TFCOUP using HTWOS.

The heat load limits were evaluated in the Waste Compatibility Program document itself and the following issue identified.

1. The basis for the heat load limits is not referenced in the compatibility program. Further work is required to determine whether these limits are valid and need to be retained, particularly due to the relatively low heat load of the majority of tanks.

Due to time limitations, detailed reviews of the following criteria were not conducted other than reviewing the compatibility program and the TSR: criticality, radiological and toxic source term, flammable gas, organic and energetic reactions, and line plugging. However, it is known that criticality, and source term require evaluation for external waste generators by the current TSR and will still be required by the DSA. The current compatibility program controls for flammable gas are not driven by the TSR. However, the DSA does introduce a new methodology for assigning waste group designations for DSTs and SSTs to prevent flammable gas hazards. The DSA will require transfers to be assessed as part of the compatibility program using this new methodology. Organic and Energetic reactions require further evaluation to determine whether they are required criteria. CRAD-1 indicated this criterion was never exceeded. Finally, line plugging is known to be a required criterion in the compatibility program, as noted in CRAD-1. However, it is also known that the current methodology requires further improvement and refinement to more adequately address the risk of precipitation during transfer and to define dilution requirements as part of the compatibility assessment.

Conclusion:
Review of the source documents for the compatibility program have identified eight (8) criteria that should be eliminated from the program. These are:

- Bulk Chemical Runaway
- DCRT Corrosion Control
- Current Waste Stream Profile Sheet
- Chemical Compatibility (based on reactivity groups)
- Waste Feed Envelope
- WFD Configuration Control
- AWF Waste Chemistry
- Waste Segregation

Further evaluation is required to determine the need for Organic and Energetic Reaction.

No basis could be found for the Heat Generation Rate criterion. Further evaluation is needed to determine whether this criterion is valid and still required.

Preliminary reviews indicate that the above two criteria may also be able to be removed from the program, further reducing the total criteria requiring assessment.

The review also identified that significant changes in the PCB Management criterion should be implemented that would only require this to be assessed (in a more limited way) for receipts from external waste generators.

The Phosphate Waste Rule requires further evaluation to verify its validity and it should be incorporated into a more generalized chemical compatibility criterion that considers the risk of precipitation of multiple components including phosphate, aluminum, and carbonate.

Further evaluation using the methodology of RPP-5926 may be able to reduce the number of transfers that require routine evaluation of Time to LFL to meet the DSA requirements.

Criticality, Radiological (DST Liquids and DST Solids) and Toxic Source Term, Flammable Gas, and Line Plugging are required criteria that need to be retained in the program.

Implementation of these changes will require the cooperation of the Environmental group to revise the DST WAP and RPP-6623 (PCB Management). Other source documents such as the OSDs will also require revision to remove requirements and issues of waste envelope and waste segregation will require evaluation as part of the TFCOUP.

Issue(s)

1. A PCB Inventory is not currently being maintained in TWINS as agreed to with ORP and Ecology in RPP-6623.

   Recommended Corrective Action: The capability exists in the BBI to develop a PCB Inventory and needs to be implemented.

2. The use of a Waste Stream Profile Sheet as specified in the DST WAP adds unnecessary paperwork and time to preparation of compatibility assessments and is not required to meet WAC-173-303.

   Recommended Corrective Action: Revise DST WAP to remove or revise requirement for WSPS, to not require assessment of chemical compatibility using reactivity groups, and to reflect other streamlining initiatives in the waste compatibility program.

3. RPP-6623 requires sampling for PCBs and assessment of receiver tank concentrations of PCBs for every transfer, although virtually all data indicates concentrations are below limits of detection or are at concentrations that are not capable of exceeding limits.

   Recommended Corrective Action: Hold internal discussions between Environmental and Engineering to agree approach to recommendations for reducing PCB Management requirements, obtain agreement with ORP/Ecology, revise RPP-6623 to reflect revised agreements.

4. Criteria for DCRT Waste Chemistry and AWF Waste Chemistry do not require assessment as part of the compatibility program

   Recommended Corrective Action: Revise OSD-11 to remove DCRT Waste Chemistry Criteria and OSD-7 to remove AWF Waste Chemistry criteria and remove criteria from compatibility program.

5. A bulk chemical runaway reaction is shown as incredible in the DSA.

   Recommended Corrective Action: Remove bulk chemical runaway from the waste compatibility program at the time of DSA implementation.

6. The criteria for evaluating time to LFL is changed in the DSA compared to the current TSR from demonstrating that the time to reach 25% of the LFL is < 7 days to demonstrating that the time to go from 25% to 100% of the LFL remains > 46 days using the methodology of RPP-5926.

   Recommended Corrective Action: Revise waste compatibility program to reflect DSA criteria for evaluating time to LFL.

7. The DSA time to LFL criteria may only be able to be exceeded for a limited number of transfers/conditions that could be pre-screened as part of DSA implementation.

   Recommended Corrective Action: Perform additional calculations based on the methodology of RPP-5926 to determine the feasibility of establishing bounding limits or waste tank groupings to identify only those wastes/conditions that are able to challenge the DSA time to LFL criteria and thereby reduce the number of transfers that require this criterion to be evaluated as part of the waste compatibility assessment.

8. The basis for the phosphate waste rule contained in the compatibility program is unclear.

Recommended Corrective Action: Further evaluation of the basis for the phosphate waste rule should be conducted. Based on this review, a revised chemical compatibility criterion should be included in the program that would consider the risk of precipitation of solids including phosphates, aluminum, and carbonates from waste mixing, cooling, or evaporation.

9. The basis for the heat generation rate criteria included in the compatibility program is not referenced.

   Recommended Corrective Action: Conduct further evaluation of the basis for the heat load limits and determine whether they should be retained in the compatibility program.

10. Waste Envelope, Waste Feed Delivery Configuration Control, and Waste Segregation criteria are better evaluated using HTWOS as part of TFCOUP preparation.

    Recommended Corrective Action: Remove Waste Envelope, WFD Configuration Control, and Waste Segregation from the compatibility program. Consider including configuration control and waste segregation as part of TFCOUP in addition to waste envelope currently evaluated.

11. Organic and Energetic Reactions may not be necessary criteria in Compatibility Program.

    Recommended Corrective Action: Evaluate the continued need for the criteria for organic and energetic reactions and remove from waste compatibility program if shown to be appropriate.

12. Criteria for source term controls and flammable gas waste group designation are changed in the DSA.

    Recommended Corrective Action: Revise Waste Transfer Compatibility Program to reflect DSA.

13. Line plugging criteria in compatibility program needs refinement to better address risks of precipitation and to incorporate dilution recommendations currently provided in separate Process Memo.

    Recommended Corrective Action: Incorporate work already conducted in response to PER-2002-1955, to define methods of specifying dilution requirements, into waste compatibility program to ensure that risks solids precipitation, including phosphate and aluminum, are fully considered as part of compatibility assessment.

CRAD 3
Program Improvement

OBJECTIVE
Identify areas of the program that have the potential for improvement and streamlining. Identify those aspects of the program that are most time consuming and methods for streamlining the production of assessments.

Approach:
Engineers and managers involved in or knowledgeable of the compatibility program will be interviewed to identify areas for improvement. A set of standard interview questions was developed and used during the assessment. In addition, less formal discussions were held with several personnel to investigate specific issues and approaches identified during the conduct of CRAD 1 and 2.

Interviewees:
The following personnel were contacted or interviewed during the course of this assessment:

D.C. Lowe	Chief Engineer
T.M. Horner	Manager, Process/Waste Transfer Engineering
N.W. Kirch	Manager, Flowsheet & Process Models
P.C. Miller	Manager, Environmental Compliance
K.D. Fowler	Criticality Safety Representative/Process Engineer
J. Jo	Process Engineer
D.M. Nguyen	Process Engineer
K.M. Bowen	Process Engineer
J. G. Field	Process Engineer
T.A. Hu	Process Engineer
C.H. Mulkey	Environmental Engineer
D.L. Herting	Chemist
D.A. Reynolds	Process Engineer

Documentation:
Consolidated responses to interview questions are provided in Table 5 of Appendix B.

Records Reviewed:
None.

Discussion of Results:
Discussions with individuals confirmed the findings obtained in CRAD-1 and CRAD-2 that there a several criteria that appeared to be unnecessarily reviewed. However, the program was considered to fulfill an important purpose. It was noted that the most time consuming aspect of preparing the assessments was development of the input data and associated confidence intervals. It was also noted that the use of Waste Stream Profile Sheets added significant time to preparation of assessments particularly for external

waste generators. The following key suggestions for streamlining the program were also noted:

1. HTWOS may be able to perform all mass balance calculations and incorporate compatibility program rules and could generate a data report to be used in support of assessments, but would need to reflect current transfers and be updated more frequently with sample data than the current once per year.

2. Spreadsheets used to perform waste compatibility assessment calculations need to be more automated and generate compliance table.

3. Tank Farms Waste Acceptance Criteria need to be formally transmitted to Fluor. They were included on distribution but no letter was sent imposing the requirements.

4. Compatibility data should be used as basis for preparing caustic limits report, rather than independently generating data.

It was also noted that sample data from external waste generators is not currently entered into TWINS or the BBI directly, since no BBI currently exists for the DCRTs. This inventory is only captured through sampling of 241-SY-102 or other tanks after waste is transferred.

Conclusion:
As indicated in CRAD 1 and 2, significant opportunities exist for streamlining the waste transfer compatibility program.

Issue(s)

1. HTWOS may be able to perform mass balance calculations in support of compatibility assessments more efficiently than the spreadsheets used currently.

   Recommended Corrective Action: Flowsheet & Process Models group should evaluate the feasibility of using HTWOS to perform mass balance calculations in support of waste compatibility assessments.

2. The spreadsheets currently used to perform compatibility assessments need to be simplified and automated to generate the compliance table.

   Recommended Corrective Action: As part of the overall program streamlining, consideration should be given to providing a greater degree of automation in the compatibility calculation spreadsheets.

3. Tank Farm Waste Acceptance Criteria have not been formally transmitted to external waste generators.

Recommended Corrective Action: Revise RPP-10726, *Requirements for Discharge from Non-Tank Farm Waste Generators into DST System*, to reflect revisions to the Waste Transfer Compatibility Program resulting from this assessment and formally transmit requirements to external waste generators.

4. Sample data from external waste generators is not currently entered into TWINS or the BBI.

   Recommended Corrective Action: Enter laboratory data packages for 222-S Laboratory Waste and Plutonium Finishing Plant, Tank D-5, into the characterization database within TWINS and incorporate data into BBI for DCRTs.

APPENDIX B – DOCUMENT REVIEWS

PROGRAM CRITERIA ASSESSMENT REVIEWS

The 22 documents listed Table B-1 below were reviewed in support of CRAD-1. Table B-2 provides a summary of the results of how many documents were in each category of response to the compatibility program criteria. The review sheets are contained in the following pages.

Table B-1 – CRAD 1 Document Review List

Document Number	Title
DST to DST Transfers	
RPP-14220	Waste Compatibility Assessment of Tank 241AP102 Waste with Tank 241AP107 Waste
RPP-14416	Waste Compatibility Assessment of Tank 241AP108 Waste With Tank 241AW102 Waste
RPP-14331	Waste Compatibility Assessment of Tank 241AP107 Waste with Tank 241AW105 Waste.
RPP-11818	Waste Compatibility Assessment of Tank 241AP108 Waste with Tank 241AW102 Waste
RPP-13638	Waste Compatibility Assessment of Tank 241AP107 Waste with Tank 241AW102 Waste
RPP-11819	Waste Compatibility Assessment of Tank 241AW106 Waste with Tank 241AP103 Waste
Catch Tank and DCRT Transfers	
RPP-16042	Waste Compatibility Assessment of DCRT 244A Waste with tank 241AP107 Waste
RPP-11804	Waste Compatibility Assessment of DCRT244S Waste with Tank 241SY102 Waste
RPP-14984	Waste Compatibility Assessment of Catch Tank A350 Waste with Tank 241AW102 Waste
RPP-11926	Waste Compatibility Assessment of Contaminated Water from Catch Tank 241UX302A with Tank 241Sy102 Waste Via DCRT 244s
RPP-14221	Waste Compatibility Assessment of DCRT 244A Waste with Tank 241AP102 Waste
SST to DST Transfers	
RPP-14387	Waste Compatibility Assessment of Tank 241C106 (SST-02-14) Waste with Tank 241AY102 Waste
RPP-15395	Waste Compatibility Assessment of Tanks 241A101 & 241AX101 (SST-03-03 & SST-03-04) Waste with Tank 241AP102 Waste
RPP-15533	Waste Compatibility Assessment of Tanks 241S101 & 241S107 & 241S112 & 241U108 Waste with tank 241SY102 Waste
RPP-14115	Waste Compatibility Assessment of Tank 241BY106 (SST-02-

Document Number	Title
	18) Waste with Tank 241AP102 Waste
RPP-16442	Waste Compatibility Assessment of Tank 241BY106 Waste (via DCRT 244BX) with tank 241AP107 Waste
	Transfers from External Waste Generators
RPP-13711	Waste Compatibility Assessment of PFP 241Z Tank D5 Waste (PFP-02-02) with Tank 241SY102 via DCRT 244TX Batch 284
RPP-11961	Waste Compatibility Assessment of 222 Lab Waste (222S-02-02) with Tank 241SY102 Waste via DCRT 244S for Batch 1
RPP-10114	Waste Compatibility Assessment of PFP Operations Tank D-5 & 241Z Waste (PFP-02-01) with Tank 241SY102 Waste Via DCRT244TX
RPP-16282	Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-03-03) with Tank 241AP108 Waste & tank 241AW102 Waste
RPP-14223	Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-03-02) with Tank 241AW106 Waste & Tank 241AW102 Waste
RPP-11817	Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-02-02-R1) with Tank 241AW106 Waste & 241AW102 Waste

Table B-2 – Program Criteria Summary Results

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit	Restrictions on transfer did not directly affect
1	Criticality	11	11				
2	Radiological Source Term Controls – DST Liquids	16	5		1		
3	Radiological Source term Controls - DST Solids	16	5		1		
4	Toxic Chemical Source Term Controls	16	6				
5	Bulk Chemical Runaway		22				
6	Time to LFL		22				
7	pH of DST Additions	12	10				
8	DST Chemistry Control		16		4	2	
9	Flammable gas		17		5		
10	Organic and Energetic Reaction		22				
11	DCRT Corrosion Control	14	3		3	2	
12	Current WSPS	11	11				
13	Chemical Compatibility		22				
14	PCB Management	2	20				
15	WFD Configuration Control	10	11		1		
16	Waste feed Envelope		18		3	1	
17	Heat Generation Rate		22				
18	AWF Waste Chemistry	21	1				
19	Phosphate Waste		20		2		
20	Line Plugging		13		9		
21	Waste Segregation		21		1		

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14220
Document Title: Waste Compatibility Assessment of Tank 241AP102 Waste with Tank 241AP107 Waste
Transfer Type: DST to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:
All of the criteria were easily met or not applicable.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14416
Document Title: Waste Compatibility Assessment of Tank 241AP108 Waste With Tank 241AW102 Waste
Transfer Type: DST to DST
Responsible Organization: Process/Waste Transfer Engineering
Assessor: Jared Templeton
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All of the criteria were easily met or not applicable.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14331
Document Title: Waste Compatibility Assessment of Tank 241AP107 Waste with Tank 241AW105 Waste.
Transfer Type: DST to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All of the criteria were easily met or not applicable.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11818
Document Title: Waste Compatibility Assessment of Tank 241AP108 Waste with Tank 241AW102 Waste
Transfer Type: DST to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/17/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All of the criteria were not applicable or easily met.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-13638
Document Title: Waste Compatibility Assessment of Tank 241AP107 Waste with Tank 241AW102 Waste
Transfer Type: DST to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/17/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All of the criteria was easily met or was not applicable.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11819
Document Title: Waste Compatibility Assessment of Tank 241AW106 Waste with Tank 241AP103 Waste.
Transfer Type: DST to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/17/2003

Program Criteria	Performance Criteria					
	Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
Criticality	X					
Radiological Source Term Controls – DST Liquids	X					
Radiological Source term Controls - DST Solids	X					
Toxic Chemical Source Term Controls	X					
Bulk Chemical Runaway		X				
Time to LFL		X				
pH of DST Additions	X					
DST Chemistry Control		X				
Flammable gas		X				
Organic and Energetic Reaction		X				
DCRT Corrosion Control	X					
Current WSPS	X					
Chemical Compatibility		X				
PCB Management		X				
WFD Configuration Control	X					
Waste feed Envelope		X				
Heat Generation Rate		X				
AWF Waste Chemistry	X					
Phosphate Waste		X				
Line Plugging				X		
Waste Segregation		X				

Additional Comments:

Most of the criteria were not applicable, or easily met. A disposition was given for line plugging for which added water would dilute the waste under the specified specific gravity requirement.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-16042
Document Title: Waste Compatibility Assessment of DCRT 244a Waste with tank 241AP107 Waste
Transfer Type: DCRT to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope				X		
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

Most of the criteria were met easily or were not applicable. Due to the low sodium content in the DCRT a disposition was made for the Waste Feed Envelope A criteria.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11804
Document Title: Waste Compatibility Assessment of DCRT244S Waste with Tank 241SY102 Waste.
Transfer Type: DCRT to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control		X				
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All of the criteria was easily met or was not applicable.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14984-R0
Document Title: Waste Compatibility Assessment of Catch Tank A350 Waste with Tank 241AW102 Waste
Transfer Type: Catch Tank to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control				X		
9	Flammable gas				X		
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

Most of the criteria were not applicable or easily met. The DST corrosion criterion failed for the source waste, but the receiver was within specification. The worst case waste from the catch tank required a flammable gas criteria disposition to be made by noting that the waste is diluted with water.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11926
Document Title: Waste Compatibility Assessment of Contaminated Water from Catch Tank 241UX302A with Tank 241SY102 Waste Via DCRT 244s
Transfer Type: Catch Tank to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control				X		
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope				X		
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

Most of the criteria were easily met or not applicable. DCRT corrosion control criteria was not met however, but was determined to be acceptable for the tank. A waste feed envelope criterion was also dispositioned because of low sodium and was determined to be acceptable since the other two receiving tanks would be in compliance.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14221
Document Title: Waste Compatibility Assessment of DCRT 244A Waste with Tank 241AP102 Waste
Transfer Type: DCRT to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control		X				
12	Current WSPS	X					
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control	X					
16	Waste feed Envelope				X		
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

Most of the criteria were easily met or not applicable. The criteria for the waste feed envelope needed a disposition because of low sodium content in the DCRT tank.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14387
Document Title: Waste Compatibility Assessment of Tank 241C106 (SST-02-14) Waste with Tank 241AY102 Waste
Transfer Type: SST to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/17/03

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control				X		
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management	X					
15	WFD Configuration Control				X		
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry		X				
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:
Most of the criteria were met easily. The source waste did not meet DST chemistry limits, however, the receiver was within specification after the addition and therefore acceptable. Since tank AY-102 is under configuration control a requirement of the assessment was that ORP approval was required prior to transfer.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-15395
Document Title: Waste Compatibility Assessment of Tanks 241A101 & 241AX101 (SST-03-03 & SST-03-04) Waste with Tank 241AP102 Waste
Transfer Type: SST to DST
Responsible Organization: Process Control
Assessor: M.A. Knight
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste				X		
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:

Most criteria were either easily met or not applicable. Because the assessment used a "worst case waste" the worst case exceeded the phosphate and s.g. limits. However, the actual waste was within limits as discussed in the criteria disposition.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-15533
Document Title: Waste Compatibility Assessment of Tanks 241S101 & 241S107 & 241S112 & 241U108 Waste with tank 241SY102 Waste.
Transfer Type: SST to DST
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids						
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control				X		
9	Flammable gas				X		
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste				X		
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:
Most of the criteria were met. Criteria were not met when bounding cases were used for DST chemistry, but when actual data was used the tank was in compliance. Criteria was also not met for flammable gas, but the disposition to dilute the waste with water allowed criteria for phosphate waste and line plugging to be met.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14115
Document Title: Waste Compatibility Assessment of Tank 241BY106 (SST-02-18) Waste with Tank 241AP102 Waste
Transfer Type: SST to DST
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X					
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions	X					
8	DST Chemistry Control		X				
9	Flammable gas				X		
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control				X		
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management	X					
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:
Most of the criteria were easily met or not applicable. A disposition was developed that diluting the waste 1:1 with water. This allows the criteria for flammable gas, DCRT corrosion control and line plugging to be met which before hand was not.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-16442
Document Title: Waste Compatibility Assessment of Tank 241BY106 Waste (via DCRT 244BX) with tank 241AP107 Waste
Transfer Type: SST to DST
Responsible Organization: Process/Waste Transfer Engineering
Assessor: M.A. Knight
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality	X	X				
2	Radiological Source Term Controls – DST Liquids	X					
3	Radiological Source term Controls - DST Solids	X					
4	Toxic Chemical Source Term Controls	X					
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control		X				
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:

All criteria either do not apply or are easily met with the exception of line plugging since raw salt well liquor exceeds 1.35 s.g. dilution is required.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-13711
Document Title: Waste Compatibility Assessment of PFP 241Z Tank D5 Waste (PFP-02-02) with Tank 241SY102 via DCRT 244TX Batch 284.
Transfer Type: Non-Tank Farm Waste Generator
Responsible Organization: Process/Waste Transfer Engineering
Assessor: M.A. Knight
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids				X		
3	Radiological Source term Controls - DST Solids				X		
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control					X	
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control					X	
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:
Chemicals are added to PFP waste prior to transfer to meet criticality requirements, as well as corrosion chemistry limits. The waste contains high solids which require further evaluation against line plugging criteria – this was addressed in the criteria disposition. An alternate method was used, with approval of NS&L, to ensure that the source term requirements of AC 5.8 were met.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11961
Document Title: Waste Compatibility Assessment of 222 Lab Waste (222S-02-02) with Tank 241SY102 Waste via DCRT 244S for Batch 1.
Transfer Type: Non Tank Farm Waste Generator
Responsible Organization: Process Control
Assessor: M.A. Knight
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids		X				
3	Radiological Source term Controls - DST Solids		X				
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control				X		
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control				X		
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All criteria easily met with exception of corrosion chemistry criteria. Disposition noted that verification sampling of future batches transferred under the WSPS would be required.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-10114
Document Title: Waste Compatibility Assessment of PFP Operations Tank D-5 & 241Z Waste (PFP-02-01) with Tank 241SY102 Waste Via DCRT244TX
Transfer Type: Non Tank Farm Waste Generator
Responsible Organization: Process Engineering
Assessor: Jared Templeton
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids		X				
3	Radiological Source term Controls - DST Solids		X				
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control					X	
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control					X	
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope					X	
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation				X		

Additional Comments:
Most of the criteria were met easily. In some instances the bounding cases did not meet the criteria, but calculations with real data were in compliance. The addition of chemicals also brought criteria into compliance. Additional dispositions allow for the acceptance of line plugging and waste segregation criteria.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-16282
Document Title: Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-03-03) with Tank 241AP108 Waste & tank 241AW102 Waste
Transfer Type: Non Tank Farm Waste Generator
Responsible Organization: Process/Waste Transfer Engineering
Assessor: M.A. Knight
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids		X				
3	Radiological Source term Controls - DST Solids		X				
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas				X		
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-14223
Document Title: Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-03-02) with Tank 241AW106 Waste & Tank 241AW102 Waste
Transfer Type: Non Tank Farm Waste Generator
Responsible Organization: Process Control
Assessor: M.A. Knight
Date: 6/16/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids		X				
3	Radiological Source term Controls - DST Solids		X				
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas				X		
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging				X		
21	Waste Segregation		X				

Additional Comments:
All criteria were easily met except the flammable gas and line plugging criteria for which a disposition was made addressing the high s.g. the waste to be diluted with water.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number: RPP-11817
Document Title: Waste Compatibility Assessment of 242A Evaporator Slurry (EVAP-02-02-R1) with Tank 241AW106 Waste & 241AW102 Waste.
Transfer Type: Non Tank Farm Waste Generator
Responsible Organization: Process Control
Assessor: M.A. Knight
Date: 6/13/2003

Criteria Number	Program Criteria	Performance Criteria					
		Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
1	Criticality		X				
2	Radiological Source Term Controls – DST Liquids		X				
3	Radiological Source term Controls - DST Solids		X				
4	Toxic Chemical Source Term Controls		X				
5	Bulk Chemical Runaway		X				
6	Time to LFL		X				
7	pH of DST Additions		X				
8	DST Chemistry Control		X				
9	Flammable gas		X				
10	Organic and Energetic Reaction		X				
11	DCRT Corrosion Control	X					
12	Current WSPS		X				
13	Chemical Compatibility		X				
14	PCB Management		X				
15	WFD Configuration Control		X				
16	Waste feed Envelope		X				
17	Heat Generation Rate		X				
18	AWF Waste Chemistry	X					
19	Phosphate Waste		X				
20	Line Plugging		X				
21	Waste Segregation		X				

Additional Comments:

All criteria easily met.

CRITERIA IMPLEMENTATION REVIEWS

The documents listed in the following table were reviewed in support of CRAD-2. The completed review sheets are contained in the following pages.

Table B-3 – CRAD 2 Document Review List

Document Number	Title
HNF-SD-WM-OCD-015, Rev. 5	Tank Farms Waste Transfer Compatibility Program
HNF-SD-WM-DQO-001, Rev.5	Data Quality Objectives for Tank Farms Waste Compatibility Programs
HNF-SD-WM-TSR-006, Rev. 2-H, AC 5.12	Tank Farms Technical Safety Requirements, Transfer Controls
HNF-SD-WM-TSR-006, Rev. 2, AC 5.8	Tank Farms Technical Safety Requirements, Source Inventory Controls
HNF-SD-WM-TSR-006, Rev. 2, AC 5.7	Tank Farms Technical Safety Requirements, Nuclear Criticality Safety
HNF-SD-WM-TSR-006, Rev. 2-N, AC 5.15	Tank Farms Technical Safety Requirements, Corrosion Mitigation Program
HNF-SD-WM-TSR-006, Rev. 3 (draft), AC 5.10	Tank Farms Technical Safety Requirements, Flammable Gas Controls
HNF-SD-WM-TSR-006, Rev. 3 (draft), AC 5.9	Tank Farms Technical Safety Requirements, Source Term Controls
HNF-SD-WM-TSR-006, Rev. 3 (draft), AC 5.11	Tank Farms Technical Safety Requirements, Transfer Controls
OSD-T-151-00011, Rev. D-1	Operating Specifications for the Active Double Contained Receiver Tanks
OSD-T-151-00007, Rev. I-2	Operating Specifications for the Double-Shell Storage Tanks
RPP-10871, Rev. 0	Technical Basis for the DST Farms Operating Specifications
65453-87-031	Phosphate Solubility in Simulated Defense Waste
65453-82-316	Effects of Mixing Waste Types – Concentrated Streams
65453-080-138	Phosphates in Defense wastes
65453-80-317	Solubility of Phosphates in Defense Waste
65453-80-296	Evaporator Feeds High in Phosphate
WAC-173-303-300,-380, -395	Dangerous Waste Regulations.
HNF-SD-WM-EV-053, Rev. 7	Double-Shell Tank Waste Analysis Plan
RPP-6623, Rev. 1	Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System
D8499312	Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste
9859695/99-WSD-001	TWRS Cessation of Segregation of Complexed Waste From Noncomplexed Waste in Hanford HLW Tanks
FDH-9857138	Cessation of Segregation of Complexed Waste From Noncomplexed Waste in Hanford HLW Tanks
RPP-5926, Rev. 2	Steady Sate Flammable Gas Release Rate Calculation & Lower Flammability Level Evaluation for Hanford Tank Waste

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: **HNF-SD-WM-TSR-006, Rev. 2-H, AC 5.12**
Document Title: **Tank Farms Technical Safety Requirements, Transfer Controls**
Responsible Organization: **Nuclear Safety**
Assessor: **M.A. Knight**
Date: **6/19/2003**

Requirements from Source Document:

- Final Tank State Controls Application. Evaluate pumped and receiving tanks prior to WASTE transfers to ensure that controls for criticality, flammable gas deflagrations, and organic solvent fires are applied to the final state of the tank. An evaluation of the WASTE chemistry of the final state of the tanks (applicable to DSTs and AWF tanks only) is also required in accordance with AC 5.15, "Corrosion Mitigation Program."

  Evaluate receiving AWF tanks and DSTs prior to WASTE transfers to determine if WASTE temperature controls LCS/LCO 3.3.2, "DST and AWF Tank WASTE Temperature Controls," and SL 2.1.1, "WASTE Temperature," are required. Controls are not required to prevent a bulk chemical runaway reaction if the tank end state will have a heat load < 21,700 watts (74,000 Btu/h) and fuel content < 52 g/L (3.8 wt%) of total organic carbon (TOC). In addition, controls are not required if an evaluation performed per the method described in HNF-3588, *Organic Complexant Topical Report*, has determined that a bulk chemical runaway is not possible.

- Chemical Compatibility. Ensure chemical additions are ≥ pH of 8 prior to transfer into tank farms (excluding water additions and drums containing caustic chemicals).

- DST and AWF Tank Time to LFL Determination. VERIFY prior to any planned transfer(s) (including WASTE and other additions) into a DST and AWF tank, that the minimum time to reach 25% of the Lower Flammability Limit (LFL) for the tank vapor space, assuming loss of the primary tank ventilation, will remain ≥ 7 days, using the methodology contained in HNF-SD-WM-CN-117, *Calculations of Hydrogen Release Rate at Steady State for Double-Shell Tanks.*

HNF-IP-1266, Section 5.12 provides clarification that the pH limit applies also to chemical additions from non-tank farm waste generators.

Requirement in Compatibility Program

Requirements are included in the compatibility program for each of the elements identified in the source document including:
Criticality –see AC 5.7
Runaway Chemical Reaction – Evaluate heat load <74,000 Btu/hr and TOC < 52 g/L
pH of chemical additions and transfers from external waste generators is evaluated.
Time to 25% LFL < 7 days

Discussion

These requirements are TSR requirements and hence must be evaluated for all transfers as required by the TSR. HNF-IP-1266 relies on the compatibility program to perform these evaluations for every transfer.

Criticality requirements will be discussed separately since they are governed by AC 5.7 and merely mentioned in AC 5.12.

As was identified from the review of 22 compatibility assessments performed under CRAD 1, the runaway chemical reaction criteria are never challenged. In addition, the DSA has identified that this accident is not credible. Hence, no controls are provided in TSR rev. 3 for this accident. This criterion should be removed from the compatibility program at the time of DSA implementation.

The pH of chemical additions is evaluated together with the pH of waste transferred from external waste generators. A requirement is contained in the new DSA AC 5.13 to perform field testing to verify that bulk chemicals shipped in tanker trucks have a pH of $\geq$ 7 before addition to DSTs, DCRTs, and catch tanks. It is not clear whether the verification of this would need to be documented in the compatibility assessment as it is currently. However, pH is an easy requirement to verify and should probably remain in the compatibility criteria.

Time to LFL is currently evaluated for all transfers and has always been found to be acceptable. Time to LFL will still be a required criterion in the DSA. AC 5.10 will require that the DST time to LFL is evaluated prior to planned waste transfers, large water additions to DSTs, and chemical additions required to manage the waste chemistry. The time from 25% to 100% of LFL shall be verified to be > 46 days using methodology of RPP-5926.

Based on the observation that the current criteria are typically always met with a substantial margin, it is anticipated that the new criteria will also typically be easily met. A cursory review of RPP-5926 indicates that there are relatively few tanks that actually pose a risk of being able to exceed this criterion under normal circumstances. If tank levels are raised, thereby reducing headspace, then it may be easier to challenge the criteria. However, it would appear that it should be possible to perform more bounding assessments that are able to establish level limits or identify that only transfers of certain wastes are able to challenge the criteria. Discussions with the author of RPP-5926 indicated that this may be a feasible approach. Performing these bounding assessments and including them in HNF-IP-1266 may permit the time to LFL to be evaluated for fewer transfers.

Issues/Recommendations:

1. As part of DSA implementation, remove criteria for chemical runaway from the waste compatibility program.
2. Revise waste compatibility program to reflect DSA criteria for evaluating time to LFL.
3. Perform additional calculations based on the methodology of RPP-5926 to determine the feasibility of establishing bounding limits or waste tank groupings to identify only those wastes/conditions that are able to challenge the DSA time to

LFL criteria and thereby reduce the number of transfers that require this criterion to be evaluated as part of the waste compatibility assessment.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: OSD-T-151-00011
Document Title: Operating Specifications for the Active Double Contained Receiver Tanks
Responsible Organization: Engineering Standards
Assessor: M.A. Knight
Date: 6/23/2003

Requirements from Source Document:
Chemistry limits are provided for DCRTs 244-BX, 244-S, and 244-TX that are the same as the DST Chemistry Limits provided in AC 5.15.
The OSD notes under Detection/Control that the specification is maintained by following the waste transfer compatibility assessment.

Requirement in Compatibility Program
Chemistry limits as contained in the source document are provided. The program notes that the receipt or transfer of waste that does not meet corrosion prevention specification limits can occur only if the receiving DCRT will remain within specification after the transfer or sufficient chemical adjustment is made to the DCRT contents such that the limits are met.

Necessary chemical additions, if any, must be made to ensure the receiving DCRT is maintained within corrosion prevention limits.

Discussion
Only three DCRTs are still in active use. 244-S receives waste from the 222-S laboratory, 244-TX receives waste from PFP, while 244-BX receives saltwell pumping waste from BY-106. Occasionally these DCRTs may receive waste from catch tanks.

Chemical adjustment of waste sent from external waste generators is made at the source to ensure compliance with the DST Chemistry limits.

Saltwell waste is not and cannot be readily adjusted prior to transfer. Although adjustment of waste at the DCRT is possible, it is not normally easy and has not been done for some time. Due to the limited remaining life of the DCRTs; all DCRTs are scheduled to be taken out of service by 2005, adjustment at the DCRT is not seen as practical or necessary.

Compliance with the DST chemistry limits for external waste generators automatically ensures compliance with DCRT limits. Remaining saltwell transfers through 244-BX will be completed in 2003. Other catch tank transfers are infrequent, small volume, and generally do not remain in the DCRT for a prolonged time. Due to the limited remaining life of the DCRTs, tracking this additional chemistry specification is not considered to add value to the assessments and should be removed from the program.

Issues/Recommendations

1. OSD-T-151-00011 should be revised to either eliminate the DCRT corrosion specification or not require its evaluation as part of the waste compatibility assessment based on compliance with DST specifications for external generators, limited additional transfers through DCRTs, and limited remaining life of tanks.
2. Waste compatibility program should be revised to remove DCRT corrosion specification as a reviewed criterion.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: 65453-87-031 & 65453-82-316
Document Title: Phosphate Solubility in Simulated Defense Waste/Effects of Mixing Waste Types – Concentrated Streams
Responsible Organization: Process/Waste Transfer Engineering
Assessor: M.A. Knight
Date: 6/23/2003

Requirements from Source Document:
The source documents quoted do not specify any requirements. The two internal letters from the 222-S Laboratory report results of testing conducted during the 1980s associated with mixing of waste streams. The documents indicate that extensive solids precipitation can occur when mixing certain concentrated waste streams containing phosphate.

Requirement in Compatibility Program
Two requirements are contained in the compatibility program.
Waste with a phosphate concentration > 0.1M is not to be mixed with:

- Waste with a sodium concentration > 8M
- Neutralized cladding removal waste (NCRW)

Discussion
The two source documents are old internal letters reporting the results of testing of phosphate wastes during the 1980s. The documents are the ones referenced as the basis for the rule in the compatibility program. The exact relation between the data reported in the two documents and the specific requirements contained in the compatibility program was unclear.
One source document, 65453-82-316, reported mixing test results associated with simulants for concentrated waste streams. The major waste stream involved in this testing was termed "Concentrated Customer Waste (CCW)," a waste containing 48% w/w Na_2HPO_4 resulting from neutralization of a decontamination solution used in N-reactor evaporated to 52% water. This waste stimulant tested had a specific gravity of 1.6. This testing was being conducted at a time when extensive evaporation was being targeted to produce DSS waste, similar to the waste that caused problems in SY-101. The CCW waste was shown to cause extensive precipitation when mixed with Zirflex Decladding Sludge (35% increase in solids volume) or Decladding waste Double Shell Slurry (73% increase in solids volume). This testing is probably the basis for the requirement noting that mixing with NCRW should be disallowed. However, discussions with engineering personnel indicated that much of this CCW waste was grouted with remaining waste now termed "Concentrated Phosphate waste" and stored in AP-106. However, the waste in AP-106 was much more dilute with a [PO_4] of 0.08M and a [Na] of 4.5M i.e. well below the Na limit noted to be of concern. It is not clear that the reported testing using the specified simulants would be representative of mixing scenarios likely to be encountered in the tank farms today.

Letter 65453-87-031 reported additional phosphate solubility data for simulated defense waste. However, the 8M Na limit was not obvious from the data contained in this letter. Further research obtained the original letter 65453-80-317, "Solubility of Phosphate in Simulated Defense Waste," dated October 29, 1980. This letter did actually contain information that would be able to support development of a limit in the form contained in the program. Review of the data did not, however, support the limit in the way it is contained in the program. A constant solubility limit of phosphate fairly independent of sodium concentration of around 0.15M at 40°C was indicated by the letter. At 50°C and 60°C a linear relationship between phosphate solubility and sodium concentration was indicated with a limit for phosphate at 50°C of around 0.3M at a sodium concentration of 8M. The letter also indicates phosphate solubility in the range 0.03M to 0.08M at around 20°C, without reference to sodium concentration. A further referenced letter, 6453-080-138, "Phosphates in Defense Waste," dated April 30, 1980, indicated an average phosphate solubility in synthetic defense waste at 50°C of 0.17M to 0.15M.

The referenced data discusses that wastes containing high concentrations of phosphates have the potential to form undesirable gell-like precipitates if over-concentrated during evaporation or mixed with concentrated wastes. These gell-like precipitates were termed "green-goo" in several documents and noted to exhibit high viscosities.

The data indicates that "hot" (50°C or 60°C) wastes may be able to contain phosphate in solution at above 0.3M at 8M sodium, which if allowed to cool to 40°C or below, the phosphate solubility would drop to possibly as low as 0.1M, thereby precipitating phosphate solids displaying these undesirable properties. However, the data would indicate this as a possibility at much lower sodium concentrations also – that would not be protected against with the current rule.

However, current supernate concentrations in tank farms are not able to challenge the current limit since the highest phosphate concentration is 0.08M in AP-106. This limit is much more likely to be challenged when retrieving SST wastes with solids containing high phosphate solids.

The data stated to be the basis for this rule, does not adequately support this rule. However, a significant volume of test work has been performed over the years to look at phosphate issues and requires further evaluation. Phosphate waste has the potential to contribute towards line plugging and solids generation problems if not adequately considered. It may be possible to combine this issue with line plugging or possibly a more generalized solids precipitation issue that would look at aluminum issues also.

Issues/Recommendations

1. The source documents stated to provide the basis for the current phosphate solubility rule to not fully support it in its current form. Other documentation exists and needs further review to determine whether the rule is valid in its current form or whether an alternate rule is appropriate that may apply to SST retrieval and solids transfers.
2. If the rule is deemed to be valid, then existing data indicates that it cannot be exceeded for liquid transfers within the DST system and should not require evaluation for those transfers.
3. Consideration should be given to whether a more generalized solids precipitation criteria is required that considers potential precipitation of solids including phosphate, aluminum, and carbonate from mixing or evaporating wastes. It may be possible to combine this with the line plugging criteria.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: WAC-173-303
Document Title: Dangerous Waste Regulations.
Responsible Organization: Environmental
Assessor: M.A. Knight
Date: 6/17/2003

Requirements from Source Document:
Key requirements from WAC include:
From Chapter 303-300. General Waste Analysis

- The owner or operator must obtain a detailed chemical, physical, and/or biological analysis of a dangerous waste. The analysis may include or consist of existing published or documented data on the dangerous waste, or on waste generated from similar processes, or data obtained by testing, if necessary.
- The owner or operator must develop and follow a written waste analysis plan that identifies: the parameters for which each dangerous waste will be analyzed, methods for obtaining these parameters, sampling methods, frequency with which analysis will be reviewed or repeated.

From Chapter 303-380. Facility Recordkeeping.

- The owner or operator of a facility must keep a written operating record at their facility.

From Chapter 303-395. Other General Requirements.

- The treatment, storage, or disposal of ignitable or reactive waste, and the mixture or commingling of incompatible wastes, or incompatible wastes and materials, must be conducted so that it does not:
  (i) Generate extreme heat or pressure, fire or explosion, or violent reaction;
  (ii) Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;
  (iii) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;
  (iv) Damage the structural integrity of the facility or device containing the waste; or
  (v) Through other like means, threaten human health or the environment.
- When required to comply with [the above requirement], the owner or operator must document that compliance in the operating record required under WAC 173-303-380(1). This documentation may be based on references to published scientific or engineering literature, data from trial tests, waste analyses, or the results of the treatment of similar wastes by similar treatment processes and under similar operating conditions.

These requirements are flowed into the Double-Shell Tank Waste Analysis Plan, HNF-SD-WM-EV-053, which adds its own requirements of how these will be complied with.
Key requirements from WAP include:

- WAP relies on DQOs as the basis for determining what analytes are necessary to properly manage mixed wastes in the DST system meeting requirement of WAC 173-303-300 (5)(a)
- Waste Stream Profile sheets (WSPS) are used to document the composition of waste entering the DST system, meeting requirements of WAC 173-303-300 (2) and -380 (1)(2)
- Waste shipper completes a Waste Stream Profile Sheet. The WSPS is a 7 page form and includes the following sections:
  I. Waste Shipper Information

II. General Waste Information (volume, frequency etc.)
III. Waste Stream Composition (components greater than 1,000mg/kg)
IV. Physical Properties
V. Specific Analysis of Waste (min, max, ave for specific parameters)
VI. Reactivity and Stability (reactivity groups)
VII. Dangerous Waste Information (waste numbers)
VIII. Land Disposal Restriction Information (waste numbers, treatment standards)
IX. Supplemental Information and Accountability Statement (certification)

A WSPS is completed for every transfer from 222-S, PFP, 242-A, and also for transfers from SSTs to DSTs. WSPS are not required for DST to DST transfers.

- WAP relies on the Compatibility Program to verify compatibility of wastes and meet requirement of WAC 173-303-395. (1)(b)
- Sampling and analysis at the Waste Shipper location is required to verify the actual waste composition matches the information contained on the WSPS. This is required for every transfer from 222-S and PFP.
- WSPS expire one year from date of approval. Approval is obtained by TFC issuing a compatibility assessment. Continuing waste transfers must have WSPS renewed or resubmitted annually.

Requirements in Compatibility Program

- A completed, current WSPS is required for each waste stream entering the DST system.
- WSPS shall expire 1 year from its approval date. WSPS must be updated, resubmitted, and approved each year for ongoing transfers.
- For each batch transfer into the DST system, the DST customer must provide written certification that the waste conforms to the approved information in the WSPS.
- Wastes entering DST system must be categorized according to Reactivity Group as part of the WSPS. The Reactivity Group numbers are used to identify potential chemical compatibility hazards prior to waste acceptance into the DST system.

Discussion

The original requirements in the WAC, although voluminous, are fairly basic requirements designed to ensure that the receiver of dangerous waste is knowledgeable of its nature and composition and that mixing of the incoming waste with existing waste in the facility will not result in a hazard to the environment. The code allows a good degree of flexibility in how the operator assures this; waste analysis is not always required and assurance of compatibility may be based on past treatment experience.

The DST WAP relies on the required submission of a WSPS for each transfer as the primary method of compliance with the WAC. The WAP makes the assumption that the compositional data provided on the WSPS is the primary basis for conducting the compatibility assessment. This is in fact not the case. Since the WAP also requires analysis of each batch from external waste generators as a method of verification of data submitted on the WSPS, the actual analytical data provided by 222-S, PFP, and 242-A is the primary data used to assure compatibility. For SST transfers, a WSPS is produced by the compatibility assessment authors based on a review of existing sample data taken from TWINS, rather than just using the data directly. The compositional data provided on the WSPS merely adds confusion to the process and often requires rework/revision to align with the actual sample analysis, particularly for PFP, and adds additional time to preparation of compatibility assessments.

The WSPS contains waste and reactivity group numbers and LDR information for each waste batch. Since waste streams received from 222-S, PFP, 242-A, and SSTs are essentially the same

type of waste year after year, this information is redundant and has long ago been collected. This information should only be required for a new waste stream. The reactivity group numbers are used to assess chemical compatibility as part of the compatibility assessment. The same numbers are always used (which is appropriate) and the waste is always found to be compatible. The chemical compatibility of waste streams currently received has long been established and should not require re-evaluation for every transfer. Only new waste types (such as oxalic acid) should require this evaluation.

The expiration date on the WSPS appears unnecessarily short. PFP and 222-S have typically made only 2 transfers each per year. It would seem that a WSPS should be able to cover a much longer period of time, say 5 years, provided the process is unchanged. For saltwell pumping of SSTs, the expiration of WSPS has driven annual updates to compatibility assessments, requiring unnecessary work since the waste being transferred had not changed from that previously evaluated.

The length of the WSPS (7 pages) burdens the compatibility assessment with unnecessary volume of paperwork, the content of which adds limited value to the assessment.

Issues/Recommendations:

1. The use of the current form of WSPS adds unnecessary paperwork and time to the preparation of waste compatibility assessments and is not required in order to meet the requirements of WAC 173-303.
2. The DST WAP should be revised to rely primarily on actual analytical data for preparation of compatibility assessments, either provided by external waste generators or taken from TWINS for SSTs. Compositional data (sections III, IV, and V) should be removed from the WSPS and analytical data used instead.
3. Consideration should be given to whether a WSPS is required at all.
4. The frequency of submission of a WSPS (if required) should be extended for current transfers from external generators (222-S, PFP, 242-A), with only a certification that the type of waste (waste numbers etc.) has not changed from that previously provided. This certification could be provided in a letter specifying the volume of waste to be transferred either annually or with each batch – this would replace/eliminate the need to verify that analytical data matched the WSPS, since the process would be reversed.
5. Use of a WSPS and any associated certifications should be discontinued for transfers from SSTs and 242-A since these should not be considered external generators.
6. Evaluation of chemical compatibility based on reactivity groups should be discontinued for all current transfers. It should only be required for new waste types.
7. Confirmation that a current WSPS is available should be removed from the compatibility assessment.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: **RPP-6623**
Document Title: **Management of Polychlorinated Biphenyl Inventory in the Double-Shell Tank System**
Responsible Organization: **Environmental**
Assessor: **M.A. Knight**
Date: **6/18/2003**

Requirements from Source Document:
Key requirements are given below:

- Waste entering the DST system from non-tank farm sources that contain PCBs must be able to demonstrate that the waste is not subject to TSCA or meet the following requirements:
    1. Must be classified as PCB remediation waste, analytical waste, or R&D waste if they have detectable PCB concentrations.
    2. Contain $\leq$ 450 ppm PCBs in the solids and $\leq$ 2.9 ppm in the liquid.
    3. Have analyses to determine total PCB concentration.
    4. Have separate analyses for both solids and liquids if the waste contains $\geq$ 0.5% solids by weight, provided quantity of solids is sufficient for analysis.
    5. Use approved EPA standard methods or approved alternative for PCB analyses.
    6. Concentration limits in #2 must be met irrespective of any dilution.
    7. The receiving tank cannot exceed the PCB inventory concentration limit of 50 ppm in the solid or 2.9 ppm in the liquid following the transfer.
    8. All other DST System waste acceptance criteria must be met as specified in [the waste compatibility program].
- The following are the criteria for approval of transfers within the DST system or from the SST system into the DST system.
    1. Intra-tank farm transfers shall have credible PCB concentration estimates or other appropriate inventory controls.
    2. Waste cannot be transferred within the DST system if the transfer would cause the receiving tank to exceed the PCB concentration limit of 50 ppm in the solid or 2.9 ppm in the liquid.
    3. PCB analysis shall be in accordance with [analysis for external wastes and DQO].
    4. All other DST System waste acceptance criteria must be met as specified in [the waste compatibility program].
    - Until PCB concentration data is available for both receiver and source tank wastes, the following criteria will be used in evaluating whether a waste transfer will cause a PCB limit in the receiver tank to be exceeded.
        - If there is no PCB data… an estimate of 25ppm for solids and 0.2 ppm for liquids will be used to determine receiver tank's initial PCB inventory concentration.
    - A PCB inventory database is used to track and manage PCBs in the DST system. The PCB Inventory System will be used to ensure that the feed to the Waste Treatment Plant does not exceed Waste Treatment Plant PCB limits. Currently the amount of PCB data is very limited but will increase as PCB analytical data becomes available.

The PCB Inventory System tracks the PCBs currently in the DST system and is updated as new waste is accepted into the system, and as wastes are transferred within the system. Periodic audits will ensure the database is properly maintained. The PCB Inventory System consists of a controlled database with most users having read-only access. TWINS will serve as the architecture to support program needs.

Requirement in Compatibility Program
All transfers reviewed using criteria as specified in first two bullets above from source document.

Discussion
All transfers are currently assessed against these criteria. All transfers from external generators are analyzed for PCBs. SST and DSTs have been and are being analyzed for PCBs on an opportunistic basis to gather data to populate the PCB Inventory. To date approximately 50-60 tanks have been analyzed for PCBs although not all those tanks have analytical data for both solids and liquids. Of the tanks analyzed, the vast majority of PCBs are below limits of detection. Of 1903 individual PCB analyses collected to date only 28 are above limits of detection. All of these 28 data points are for solids samples with all but two data points lying in the range 0.01ppm to 7 ppm. Two data points exist for tank 241-TY-106 at 38 ppm and 63 ppm respectively. Although these data points are claimed to be valid in TWINS, they appear suspect since the same Aroclors sampled from a different riser in the same tank indicated only 0.8 ppm and 0.7 ppm respectively. No liquid samples had PCBs above limits of detection, which is to be expected due to the low solubility of PCBs.

Sample data for waste received from 222-S and PFP indicates a similar situation (although all data was not available for review), with liquid analyses being below limits of detection and solids analyses being at very low concentrations of PCBs or not detected.

Currently the compatibility program collects PCB data for all tanks/wastes involved in a transfer and calculates final receiver concentrations. These calculations are generally based on default values or limits of detection that are well below the concentrations of concern. It is clear from review of the available PCB data for DSTs and SSTs that, with the exception of the one outlying data point for TY-106, that it is not possible to exceed the 50 ppm solids and 2.9 ppm liquid concentration limits. The calculations being performed add no value since the available data would never preclude a transfer on the basis of PCB concentration.

Review of the PCB data available in TWINS highlighted that a PCB Inventory is not being maintained in the manner agreed to in RPP-6623. Although raw sample data is collected in TWINS for DSTs and SSTs, an actual inventory by tank is not being maintained. The capability to do so exists within the BBI but has not been utilized to date.

Issues/Recommendations:

1 Agreement should be reached with ORP and Ecology that sampling of liquids for PCBs should be discontinued as part of the PCB management program based on the data collected

to date showing all analyses are below detection limits and knowledge of the very low solubility of PCBs. This would save substantial cost for expensive analyses.

2 A true PCB Inventory needs to be entered into the BBI as agreed to with ORP and Ecology in RPP-6623.

3 The compatibility program should be revised to remove PCBs as a criteria for evaluating Intra-Tank Farm transfers based on data collected to date.

4 The compatibility program should be revised for transfers from external generators to not calculate the final receiver tank concentration under normal circumstances. Waste generators should state based on analysis of their waste that PCB concentrations is $\leq$ 50 ppm in solids and $\leq$2.9 ppm in liquids. With that certification no calculations are necessary to confirm that the receiver tank cannot exceed those concentrations. Only in the situation in which solids concentration was above 50 ppm but $\leq$ 450 ppm (which it is not clear has ever happened) would a calculation of the receiver tank concentration be required.

5 Requirements in RPP-6623 that "All other DST System waste acceptance criteria must be met as specified in [the waste compatibility program]" should be removed since this is not related to management of PCBs.

6 RPP-6623 should be revised and approved by ORP/Ecology (if required) to reflect above changes in compatibility program and sampling requirements.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: OSD-T-151-00007, Rev I-2
Document Title: Operating Specification for the Double Shell Storage Tanks
Responsible Organization: Process Control
Assessor: Jared Templeton
Date: 6/23/2003

Requirements from Source Document:
Tank 241-AZ-101 $[Na^+] \leq 5.5$ Moles/L (M)
Tank 241-AZ-102 $[Na+] \leq 5.0$ M
When $1.0M < [NO_3^-] < 3.0M$; $[OH^-] \geq 0.8M$
When $[NO_3^-] + [NO_2^-] > 5M$; $[OH^-] \geq 1.0M$

Requirement in Compatibility Program
The requirements are implemented in the compatibility program exactly as stated in the source document and are checked for all transfers.
Discussion
The five molar sodium rule was designed to prevent bumping and temperature excursions by limiting the sodium ion concentration in aging waste tanks to 5 M. For the same reasons, a sufficient OH^- concentration used to be maintained to keep aluminum dissolved in the aluminate form and inhibit the formation of gibbsite. Initially, limiting the volume of settled solids, specifically gibbsite, was desirable to inhibit overheating and bumping of waste.

The tank waste has cooled over time and does not contain the heat load it once used to. It appears that the 5 M sodium rule was imposed to prevent solids from forming in the aging waste. A report prepared in 1998, prior to C-106 initial sluicing, indicated that the sodium concentration could be increased to 7 M without precipitating many solids. This is because the concentration of soluble sodium salts is low.

Because the heat load of the aging waste has declined and overheating of the waste by the accumulation of solids is not a concern the 5 M sodium rule should be deleted from OSD and removed from the waste compatibility program. The rule is based on concerns that existed when true aging waste was being received and has now become outdated. The rule is intended to protect against solids precipitation. However, both the AY and AZ tank farms have significant volumes of solids already e.g. AZ-101 contains 52 kgal of sludge and AZ-102 contains 105 kgal.

It is recommended that the rule be removed from the OSD and compatibility program.

Issues/Recommendations
1. The AWF waste chemistry rule is outdated and should be removed from both OSD-T-151-00007 and the compatibility program.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: 9859695
Document Title: TWRS Cessation of Segregation of Complexed waste from noncomplexed waste in Hanford HLW Tanks
Responsible Organization:
Assessor: Jared Templeton
Date:6/23/2003

Requirements from Source Document:

1. The TOC in the waste in less than the envelope A specification limit, currently 0.5 moles of organic carbon per mole of sodium (Na).
2. The concentration of ^{90}Sr is less than the Envelope A specification limit, currently, 4.4E7 Becquerels (Bq) per mole of Na.
3. The concentration of TRU is less than Envelope A specification limit, currently, 4.8E5 Bq per mole of Na.
4. Complexed concentrate (CC) waste should be stored with other CC waste if practical.
5. A list of waste feed delivery tanks for Phase I privatization is provided in the document that shall not have waste placed into them without written approval from DOE. This list was updated in a follow on letter from ORP in 2000.

Requirement in Compatibility Program

Three criteria in the program cover these criteria, Waste Feed Envelope, WFD Configuration Control, and Waste Segregation.

1. The TOC in the waste is less than Envelope A specification limit, currently 0.5 moles of TOC per mole of Na.
2. The concentration of Sr^{90} is less than the Envelope A specification limit, currently 4.4E+07 Becquerels (Bq) per mole Na.
3. the concentration of TRU is less than the Envelope A specification limit, currently, 4.8E+05 Bq per mole of Na.
4. The program also considers waste segregation by aiming to separate complexed and non-complexed wastes and TRU from non-TRU wastes.
5. Waste shall not be transferred into any tank listed in Boston 2000 without prior written approval from ORP.

Discussion

The waste envelope criteria in the program currently only checks for three components for envelope A. The intent is to avoid making envelope C to the extent practical. However, it doesn't avoid making envelope B which would have implications on glass volumes. Overall, the criteria serves little purpose as structured.

Waste envelopes are currently checked as part of the annual revision to the TFCOUP using HTWOS. This is the more appropriate tool to evaluate waste envelopes well ahead

of the time of a transfer and is able to evaluate all envelopes and alternate transfers to resolve issues.
The restriction on waste transfers into tanks placed under configuration control for Waste Feed Delivery is also better controlled during the up-front planning process for transfers as part of the TFCOUP.

Waste segregation is also a criterion that is better evaluated as part of the TFCOUP and planning process for transfers rather than at the time of transfer.

Issues/Recommendations

1. The criteria of Waste Envelope, WFD Configuration Control, and Waste Segregation should be removed from the compatibility program and evaluated as part of the TFCOUP using HTWOS.

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number: **HNF-SD-WM-OCD-015, Rev. 5**
Document Title: Tank Farm Waste Transfer Compatibility Program
Responsible Organization: **Process Control**
Assessor: **Jared Templeton**
Date: **6/27/03**

Requirements from Source Document:
No source document is quoted for heat load criteria in the compatibility program.
Requirement in Compatibility Program
Tank Farms

241-AN, 241-AP, 241-AW	Max heat generation rate (BTU/hr)	70,000
241-AY, 241-AZ	Max heat generation rate (BTU/hr)	4,000,000
241-SY	Max heat generation rate (BTU/hr)	50,000

Discussion
The heat load criterion for each tank is limited to prevent localized boiling in all tanks other than AY and AZ Tank Farms, which were noted to be designed for boiling. However, no basis is referenced for these limits in the compatibility program. Due to time limitations for this assessment, the original source could not be traced. It was noted in discussions with the ventilation design authority that no heat load limits are included in the ventilations SDDs. It is also likely that the limit quoted for AY and AZ Tank Farms is no longer correct since the ventilation system for these tanks was upgraded by the 702-AZ ventilation system, which reduced the total flow rate of the ventilation system. These tanks are also now designed to prevent boiling.

Evaluation of the heat loads for all 177 SSTs and DSTs indicates that only four have heat loads above the 70,000 BTU/hr limit applicable to the East Area DSTs. These tanks are AY-102, AZ-101, AZ-102, and C-103. Only about 20 tanks have heat loads over 20,000 BTU/hr. With the majority of tanks having heat loads much lower than the limits, it is difficult for any individual transfer to exceed the DST limits with the exception of transfers out of aging waste tanks (which is not planned). However, surpassing the limit values could happen if tank sludge from multiple tanks were combined into one single tank. As indicated in CRAD 1 no assessments reviewed exceeded this criterion.

Issues/Recommendations
1. The basis for the heat load limits is not referenced in the compatibility program. Further work is required to determine whether these limits are valid and need to be retained, particularly due to the relatively low heat load of the majority of tanks.

CONSOLIDATED INTERVIEW RESPONSES

The consolidated responses to interview questions are contained in Table B-4 below:

Table B-4 – Consolidated Interview Responses

Item	Question	Answers
1	**What do you believe the purpose of the compatibility program is?**	Compatibility Program should ensure that transfers of waste meet the TSR requirements related to/dependent on tank waste chemistry and prevent operational problems such as line plugging.
		Since tanks contain such varying waste compositions, we need to ensure that mixing of waste stream does not cause any surprises.
2	**Does the program meet that purpose in the current way it is implemented? If not, why not?**	Program meets some of these requirements but also appears to review a lot of unnecessary criteria that are not of concern to us.
		Yes. But it does not necessarily do it in the simplest way.
3	**Have you identified any issues with the format of compatibility assessment documents? What are they?**	The documents tend to be lengthy and contain repetitive information. The main body of the document has been streamlined and is appropriate, but the calculation spreadsheets in the appendices are split into two parts that are repetitive of each other. It appears that it should be possible to combine much of the information contained in the spreadsheets and the compliance table into a single spreadsheet to reduce the volume of paperwork in the assessment. There is no particular page limit required for the document. It should be whatever is required. It just appears that the document could be streamlined.
		There may be additional things that should be checked. We generally rely on the knowledge of the people doing the assessments to ensure that consideration is given to appropriate elements. e.g. mixing is assumed to be perfect, when there may be situations where that is not reasonable. Precipitation of solids is not specifically looked at as a criteria e.g. carbonate precipitation in AN-107 was identified based on testing but there was no question in the program that would have made somebody check for it. There is nothing that stops us adding dilute waste on top of recently concentrated waste.
4	**Review the list of criteria that are reviewed for each assessment. Do you believe**	We currently review a total of 21 criteria, whereas it appears that there are only six or so that we are really interested in.

Item	Question	Answers
	that these criteria are appropriate? If not, why not?	Examples of criteria that appear are unnecessary include: PCBs – always limit of detection DCRT corrosion control – limited life of tanks, should generally be met if DST chemistry control is met.
		Use of the formal calculation process has proved difficult but is being worked through. The size of the documents makes it difficult to respond to last minute field changes quickly. Additional criteria have been added to the program over the years – there used to be only 12, whereas now there are 21.
5	**Do you have any suggestions for how the program may be improved or streamlined?**	Need to focus on only those criteria that are important and avoid reviewing unnecessary items. The DSA relies on the compatibility program for several TSRs, so it is important that the program be seen as credible. Where feasible the document should be streamlined and avoid repetition.
		Waste feed Envelope does not add value since it only reviews three elements of one envelope, DCRT corrosion control is basically covered by DST chemistry, at least for external generators, pH of chemical additions does not add much value, AWF waste chemistry does not apply any longer since we don't really have aging waste.
6	**If you are a preparer or checker of assessments, what aspects of preparing the assessments are the most time consuming?**	Looking up and developing input data is most time consuming; BBI is only updated every quarter and hence has to be updated to reflect active transfers and recent sample results. Calculating confidence limits for the data is time consuming. Preparation of an assessment generally takes from 1 day to 2 weeks, average is one week. Approximately 3 months is required for a PFP assessment with a significant period of time spend in going back and forth to correct waste stream profile sheets – significant time could be saved on both sides if we did not have to use waste stream profile sheets.
7	**Do you have any suggestions for how the program may be improved or streamlined?**	5. HTWOS may be able to perform all mass balance calculations and could generate a data report to be used in support of assessments, but would need to reflect current transfers and be updated more frequently with sample data than once per year. 6. Need to set up spreadsheets to be more automated and generate compliance table. 7. Remove data ranges from Waste Stream Profile Sheets to avoid rework against sample data. 8. Tank Farms Waste Acceptance Criteria need to be formally transmitted to Fluor. They were included on distribution but no letter was sent imposing the requirements.

Item	Question	Answers
		9. Ensure that Operations work to the transfer schedule so that last minute rework is avoided because an alternate transfer sequence is selected. 10. Compatibility data should be used as basis for preparing caustic limits report, rather than independently generating data.
8	**Is analytical data from external waste generators entered into TWINS?**	No, I don't think so. It is unclear how it is factored in to BBI.

APPENDIX C – PER SUMMARY

A summary of PERs associated with waste compatibility assessments is provided in Table C-1 below. PER-2001-2485 identified issues with the format and clarity of assessments and although most actions have been completed, revisions to the calculation spreadsheet are still required to improve clarity of calculations and a specific procedure for compatibility assessments needs to be developed. PER-2002-1955 identified limitations with the way that precipitation is addressed in compatibility assessments and required development of a procedure/document for assessing precipitation/solubility and recommending dilution requirements. PER-2002-6020 and PER-2003-2033 are associated with issues with implementing the proposed DSA methodology of assessing gas retention hazards – this latter issue requires further assessment to ensure an effective method is employed in the compatibility program.

Table C-1 – Summary of Compatibility Assessment PERs

PER Number	Date Initiated	Problem Description	PER Status	PER Status Date
PER-2001-2257	12/6/2001	The transfer procedure does not contain Waste Compatibility verification. Waste Compatibility was previously addressed in the ART log, which has recently been cancelled.	CLOSED	12/6/2001
PER-2001-2485	11/27/2001	Reviewed RPP-9241 "Waste Compatibility Assessment for DCRT244-BX Waste (Tanks 241-BY-105 and 241-BY-106) with Tank 241-AP-102 Waste", and the following comments were generated (details in the MOP report):	OPEN	6/26/2002
PER-2002-0784	2/6/2002	The 242-A Evaporator Safety Analysis Report (SAR) contains source term limits for various radionuclides. Catch tank 241-A-350 waste is routed through the 242-A Evaporator via a jumper to Double-Shell Tank (DST) 241-AW-102.	Closed	
PER-2002-0788	2/6/2002	The existing program to ensure compliance with AC 5.15 of HNF-SD-WM-TSR-006 may be inadequate. While a document does exist to project caustic depletion in Double-Shell Tanks (DSTs), it is not utilized to declare a tank out-of-compliance.	Closed	
PER-2002-1439	3/12/2002	An independent assessment of engineering calculations found a number of cases of inattention to details.	OPEN	11/7/2002
PER-2002-1955	4/10/2002	A meeting was held between Operations and Engineering on 4/5/02 to discuss issues related to 241-AP-102 Pumping Problems. Pumping from AP-102 to AP-107 was stopped on 4/1/02 due to reported low flow and high amps.	OPEN	10/28/2002
PER-2002-4715	8/31/2002	The current revision of the Tank Waste Compatibility Program, HNF-SD-WM-OCD-015, Rev. 4-D, needs to be revised and updated to bring it in line with current basis documents. Revision 5 to the document has been prepared but is not yet released.	Closed	
PER-2002-5390	10/3/2002	Reviewed three recent waste compatibility analyses and uncovered the following issues: no basis provided or referenced in the RPP-11953 for the assumption regarding the quantity of free organic expected to be transferred …	Closed	10/7/2002
PER-2002-6020	11/12/2002	Process Engineering was verbally informed by Nuclear safety and Licensing in the afternoon of November 11, 2002 of the results of preliminary calculations associated with the transfer of waste from SY-102 to SY-101 using a revised methodology for assessing and categorizing the risk of flammable gas hazards.	Closed	11/14/2002
PER-2003-	1/15/2003	The Pre-Evaluated Limits for DST and AWF Tank Water Additions Table is out of date and must be updated in a	Closed	1/20/2003

PER Number	Date Initiated	Problem Description	PER Status	PER Status Date
0203		timely manner to support facility operations, including flushing of waste transfer routes upon completion of the transfer.		
PER-2002-6557	12/18/2002	During engineering review of waste compatibility assessment for C-103 it was discovered that the total waste volume allowed had been exceeded. The compatibility assessment (RPP-11953) is written to a total volume sent to AN-106 of 100,000 gallons.	OPEN	1/30/2003
PER-2003-0453	1/30/2003	The waste compatibility assessment for saltwell pumping of U-111, RPP-14222, issued 1/22/03, states in Section 2.0, Conclusions and Requirements, that up to a total of 80,000 gallons of waste from tank 241-U-111 may be transferred to tank 241-SY-102.	Closed	6/18/2003
PER-2003-0950	3/3/2003	The 241-A-417 to 241-AP-102 transfer (TO-270-036) was scheduled for 2/27/03, while completing the Transfer Controls checklist as part of the pre-requisites for the transfer procedure it was discovered that the Waste Compatibility Assessment Memo was obsolete.	Closed	3/5/2003
PER-2003-1677	4/30/2003	A MOP was performed to determine whether the new calculation procedure TFC-ENG-DESIGN-C-10, rev A (effective 5/5/03) would be suitable for Waste Compatibility Assessment calculations.	OPEN	6/24/2003
PER-2003-1874	5/15/2003	As part of an engineering procedure update, the requirements of CPS-T-149-00012, Criticality Prevention Specification, were reviewed. Several requirements were identified that either have not been complied with or are not adequately implemented.	OPEN	5/20/2003
PER-2003-2033	5/29/2003	When performing a waste feed compatibility assessment pertaining to evaporator run 03-03 and a proposed waste transfer to 241-AW-106, a weakness in the methodology used to predict the post-operation tank waste category was found.	OPEN	6/3/2003
PER-2003-2068	5/30/2003	Engineering Management Assessment on Calculations (2003-ENG-M-0012), Observation 1, states that incorrect units are contained in the column headings in repetitive-use spreadsheet used for conducting waste compatibility assessments included in RPP-1604.	OPEN	6/3/2003

APPENDIX D – ASSESSMENT PLAN

CH2M HILL Hanford Group, Inc.
Engineering Specialty Assessment Plan
of Tank Waste Compatibility Reporting (FY2003-ENG-S-0044)

Prepared by: _____
M.A. Knight
Process/Chemical Lead Discipline Engineer

Approved by: _____ _____
M.A. Fish Date
Manager, Engineering Standards

Purpose

The purpose of this Engineering Specialty Assessment is to review the Tank Farm Waste Transfer Compatibility Program to assess whether the program meets the needs of accelerated retrieval and closure and waste feed delivery and to identify areas and methods for streamlining the program.

Assessment Scope and Performance Criteria

The scope of this assessment will include sample reviews of compatibility assessments produced since July 1, 2002; the assessments will include transfers from both tank farm and non-tank farm waste generators. The assessment will also review supporting documents for the waste compatibility program to determine the drivers for criteria being assessed. The assessment will also include interviews with engineering staff and managers to identify areas for improvement and streamlining in the program. The assessment will not focus on procedural compliance of the compatibility assessments.

The Tank Farms Waste Transfer Compatibility Program is documented in HNF-SD-WM-OCD-015, Rev. 5.

The key areas of this assessment are listed below with a discussion of how each will be evaluated in the assessment:

1. Program Criteria Compliance
   The assessment will review a sampling of compatibility assessments for both internal tank farm transfers and transfers from non-tank farm waste generators such as 222-S Laboratory and Plutonium Finishing Plant.

   Assessment Performance Objective: Identify the degree to which program criteria are met without placing restrictions on the transfer. This review may assist in identifying criteria that would not normally require assessment or control for tank waste transfers.

2. Criteria Implementation
   The assessment will review the tank waste transfer compatibility program together with key supporting and driving documents.

   Assessment Performance Objective: Identify whether supporting and driving documents require criteria to be assessed for each transfer in the manner in which they are currently assessed. Identify whether the criteria specified in driving documents are appropriate and whether opportunities exist for eliminating criteria by revising supporting documents.

3. Program Improvement
   Engineers and managers involved in or knowledgeable of the compatibility program will be interviewed to identify areas for improvement.

   Assessment Performance Objective: Identify areas of the program that have the potential for improvement and streamlining. Identify those aspects of the program that are most time consuming and methods for streamlining the production of assessments.

Further details of the performance criteria and review approaches are contained in the Criteria and Review Approaches Documents (CRAD) contained in Attachment 1.

Team Members and Responsibilities

Team Members are:

- M.A. Knight Assessment Team Lead
- J. Templeton Technical Specialist

The Team Lead is responsible for managing the assessment. The Team Lead is responsible for review of the assessment plan and assessment forms prepared by the team members. The Team Lead will convene team meetings as necessary and will keep CH2M HILL Engineering management apprised of significant findings by the team.

The team members are responsible to conduct a comprehensive review based on the criteria specified in Attachment 1. Team members will document their review on the Assessment Forms found in Attachment 1. Team members will document any findings on the Assessment Forms for use in generating Problem Evaluation Requests (PERs).

Schedule

The schedule for the Specialty Assessment is provided below:

Obtain Plan Approval	June 12, 2003
Review Compatibility Program/Supporting Documents	June 12-17, 2003
Review Sample Compatibility Assessments	June 18-19, 2003
Conduct Interviews	June 19-25, 2003
Prepare Draft Report	June 25-27, 2003
Issue PERs	June 27, 2003
Meet with Second Level Manager (D. Lowe)	June 27, 2003
Issue Report	June 30, 2003

Assessment Methodology

The assessment team will perform the Specialty Assessment in accordance with this plan, using a combination of document reviews and personnel interviews. Management will be kept informed during the course of the assessment to eliminate unexpected results or findings when the assessment is complete.

A final report will be produced that will serve as the record for this assessment. Personal notes and information will be made available should questions arise during the management closeout.

CRAD 1
Program Criteria Compliance

OBJECTIVE

Identify the degree to which program criteria are met without placing restrictions on the transfer. This review may assist in identifying criteria that would not normally require assessment or control for tank waste transfers.

Performance Criteria

1. Criteria do not apply to the reviewed transfer.
2. Criteria were met based on analytical data with no restrictions.
3. Criteria were met based on analytical data with restrictions on volumes.
4. Criteria were not met based on raw data, but a disposition was developed permitting the transfer.
5. Criteria were not met based on raw analytical data, but a chemical adjustment prior to transfer permitted the transfer to proceed.
6. Restrictions were placed on transfer that did not directly affect compliance with the criteria.

Approach

Review of a sample of compatibility assessments developed since July 1, 2002 for both tank farm and non-tank farm transfers including:

- Saltwell transfers
- DST to DST transfers
- Evaporator campaigns
- 222-S Laboratory transfers
- PFP transfers

Documentation:

Complete the Document Assessment review form for program criteria compliance.

Records reviewed:

List all documents reviewed.

Discussion of Results:
From a review of the performance criteria, assess whether there are any criteria that are reviewed but typically are always met, criteria that apply to only a limited number of transfers but are reviewed for all, whether criteria are reviewed that are not typically met but are dispositioned, criteria that generally apply and are important. Identify issues, areas for improvement, and their basis.

Conclusion:
Provide a clearly written conclusion summarizing the results and identifying issues and areas for improvement and streamlining.

Issue(s)
For each issue identified as a result of this element include a description of the concern or problem, immediate action taken (if any), and recommended corrective action or improvement.

CRAD 2
Criteria Implementation

OBJECTIVE
Identify whether supporting and driving documents require criteria to be assessed for each transfer in the manner in which they are currently assessed. Identify whether the criteria specified in driving documents are appropriate and whether opportunities exist for eliminating criteria by revising supporting documents.

Performance Criteria
1. Criteria are taken directly from a source document that requires the criteria to be assessed for each transfer.
2. Criteria are based on a source document but method of assessment is self imposed.
3. Criteria are important operational requirements based on good engineering practice that require assessment for each transfer.
4. Criteria are unnecessary, outdated, or cannot be complied with.

Approach
The assessment will review the Tank Waste Compatibility Program and supporting documents including:
Double Shell Tank Waste Analysis Plan
Management of the PCB Inventory in the DST System
Operating Specifications Documents
AC 5.7, Nuclear Criticality Safety
AC 5.8, Source Inventory Controls
AC 5.12, Transfer Controls
AC 5.15, Corrosion Mitigation Program
WAC 173-303, Dangerous Waste Regulations

Documentation:
Complete the Document Assessment review form for Program Implementation.

Records Reviewed:
List all records reviewed.

Discussion of Results:
From a review of performance criteria for the various documents, assess whether the criteria from the source documents are appropriately implemented. Discuss any issues identified and basis. Identify any unnecessary requirements or areas where changes in source documents are required. Identify criteria that could be removed from compatibility program and basis.

Conclusion:
Provide a clearly written conclusion summarizing the results and identifying issues and areas for improvement and streamlining.

Issue(s)
For each issue identified as a result of this element include a description of the concern or problem, immediate action taken (if any), and recommended corrective action or improvement.

CRAD 3
Program Improvement

OBJECTIVE
Identify areas of the program that have the potential for improvement and streamlining. Identify those aspects of the program that are most time consuming and methods for streamlining the production of assessments.

Approach:
Engineers and managers involved in or knowledgeable of the compatibility program will be interviewed to identify areas for improvement. A set of standard interview questions will be developed during the assessment.

Interviewees:
List names of persons interviewed. The preliminary list of interviewees is provided below but may be changed during the assessment:

D.C. Lowe	Chief Engineer
T.M. Horner	Manager, Process/Waste Transfer Engineering
N.W. Kirch	Manager, Flowsheet & Process Models
P.C. Miller	Manager, Environmental Compliance
V.C. Boyles	Process Engineer
J.A. Lechelt	Process Engineer
K.D. Fowler	Process Engineer
C.H. Mulkey	Environmental Engineer

Documentation:
Records comments from interviewees with respect to identified issues with the program, unnecessary criteria, and suggestions for improvements, and streamlining.

Records Reviewed:
None.

Discussion of Results:
List performance criteria evaluated in this assessment element and the results obtained. Clearly identify and issues and the basis together with improvements suggested.
Conclusion:
Provide a clearly written conclusion summarizing the results and identifying issues and areas for improvement and streamlining.

Issue(s)
For each issue identified as a result of this element include a description of the concern or problem, immediate action taken (if any), and recommended corrective action or improvement.

Assessment Report Format

The assessment report will include the following sections:

Executive Summary

Section 1 – Introduction

Purpose of the Assessment
Review Process and Methodology

Section 2 – Assessment Observations

Section 3 – Conclusions

Section 4 – Follow-up Actions

Attachments

Completed CRADS
PER Summary
Assessment Plan
Team Members

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Program Criteria Compliance

Document Number:
Document Title:
Responsible Organization:
Assessor:
Date:

Program Criteria	Performance Criteria					
	Criteria Does not Apply to Transfer	Criteria met with no restrictions	Criteria met with restrictions on Volumes	Criteria not met based on raw data but disposition developed	Criteria not met based on raw data but chemical adjustment made to permit transfer	Restrictions on transfer did not directly affect compliance
Criticality						
Radiological Source Term Controls – DST Liquids						
Radiological Source term Controls - DST Solids						
Toxic Chemical Source Term Controls						
Bulk Chemical Runaway						
Time to LFL						
pH of DST Additions						
DST Chemistry Control						
Flammable gas						
Organic and Energetic Reaction						
DCRT Corrosion Control						
Current WSPS						
Chemical Compatibility						
PCB Management						
WFD Configuration Control						
Waste feed Envelope						
Heat Generation Rate						
AWF Waste Chemistry						
Phosphate Waste						
Line Plugging						
Waste Segregation						

Additional Comments:

DOCUMENT ASSESSMENT REVIEW
Specialty Assessment #0044
Criteria Implementation

Document Number:
Document Title:
Responsible Organization:
Assessor:
Date:

Requirements from Source Document:
List requirement(s) as specified in source document

Requirement in Compatibility Program
List requirement(s) as specified in Compatibility Program

Discussion
Consider:

5. Are criteria taken directly from the source document that requires the criteria to be assessed for each transfer?
7. Are criteria based on the source document but method of assessment is self imposed?
8. Are criteria important operational requirements based on good engineering practice that require assessment for each transfer?
9. Are criteria unnecessary, outdated, or cannot be complied with?

10. Could/should a change to the source document be implemented to remove the requirement?

APPENDIX E - TEAM MEMBER QUALIFICATIONS

Mark A Knight
Mr. Knight is the Process/Chemical Engineering Lead in the Engineering Standards Group. He has over 16 years experience in the nuclear industry in both the United States and Europe, including 9 years experience at the DOE Hanford Site. Mr. Knight's background includes design, engineering, and project management experience in nuclear waste storage and treatment facility design, construction, and operations gained with commercial operating and Architect/Engineering companies. His experience includes process design and operations support, specification and oversight of laboratory, pilot, and full scale equipment and process testing, construction oversight, start-up engineering, and procedure and standards development. Mr. Knight holds a B. Eng. In Chemical Engineering and possesses the certification of Chartered Engineer from the United Kingdom.

Jared W. Templeton
Mr. Templeton is a senior at Brigham Young University where he is pursuing a BS degree in Chemical Engineering along with a minor in chemistry education. In 1998 he worked for Pacific Northwest National Laboratory assisting in the design and construction of radiation detection systems.