RPP-17266, Rev. 2

Plan for Development of the DST Integrity Assessment Report

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U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN:	UC:
Cost Center:	Charge Code:
B&R Code:	Total Pages: 94

Key Words: DST, DSTAR, Integrity, Assessment, WAC 173-303-640, M-48-14

Abstract: Describes the required tasks and schedule to successfully produce a DST integrity assessment report that meets M-48-14 and complies with WAC 173-303-640(2).

DEC 19 2005
DATE: HANFORD RELEASE
STA: H
18

L. E. Fox 12-19-05

Release Approval Date Release Stamp

Approved For Public Release

Tank Farm Contractor (TFC) **RECORD OF REVISION**	(1) Document Number RPP-17266 Rev. 2	Page 1

(2) Title

Plan for Development of the DST Integrity Assessment Report

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Resp. Engr. (print/sign/date)	(6) Resp. Mgr. (print/sign/date)
1	Extensively revised. Added Appendix C.	J Huber 2-4-05	G Duncan
2 RS	Revised by IQRPE to: modify section 2.3 assumptions, revise Table 2-1 schedule completion dates, make minor editorial clarifications in the body of the document, and update the comments column in Appendix C.	D.E. Bowers D.C Bowers 12-13-05	B.H. Thacker BHT 12/14/05

Plan for Development of the DST Integrity Assessment Report

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December 9, 2005

EXECUTIVE SUMMARY

The Hanford double-shell tanks (DSTs) and ancillary equipment are considered a Treatment Storage and Disposal (TSD) unit, under regulations stemming from the Resource Conservation and Recovery Act of 1976. *Configuration and operation of these facilities is regulated under 40 CFR 265, Subpart J, and Washington's "Dangerous Waste Regulations," Washington Administrative Code (WAC) 173-303-640. These regulations require integrity assessments of tank systems that store dangerous waste and determination by an Independent Qualified Registered Professional Engineer (IQRPE) as to whether the tank system is leak tight, with adequate structural integrity and otherwise fit for use over the life of the mission.*

This plan delineates the activities, reviews, analyses, evaluations and examinations necessary to support the development of the Double Shell Tank Integrity Assessment Report (DSTAR) to be issued on or before March 31, 2006, as required per Tri-Party Agreement Milestone M-48-14.

Twenty-Five separate tasks have been identified, which when complete, will allow the IQRPE to lawfully certify the Double Shell Tank integrity Assessment Report (DSTAR).

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ACI	American Concrete Institute
ALARA	As Low As Reasonably Achievable
AOR	Analysis of Record
API	American Petroleum Institute
ASA	Accelerated Safety Analysis
ASCE	American Society of Civil Engineers
ASM	American Society for Metals
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
BNL	Brookhaven National Laboratory
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Hanford Group, Inc.
CT	Catch Tank
DCRT	Double-Contained Receiver Tank
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DST	Double-Shell Tank
DSTAR	Double Shell Tank Integrity Assessment Report
DSTIP	Double-Shell Tank Integrity Project
Ecology	Washington State Department of Ecology
EN	Electrochemical Noise
ER	Electrical Resistance
ESH&Q	Environmental, Safety, Health, and Quality Assurance
FY	Fiscal Year
HEPA	High Efficiency Particulate Air
IQRPE	Independent Qualified Registered Professional Engineer
NACE	National Association of Corrosion Engineers
NDE	Nondestructive Examination
ORP	U.S. Department of Energy, Office of River Protection
OSD	Operating Specification Document
PNNL	Pacific Northwest National Laboratory
PCSACS	Personal Computer Surveillance Analysis Computer System
QA	Quality Assurance
RPP	River Protection Project
RCRA	Resource Conservation and Recovery Act of 1976
RCW	Revised Code of Washington
SAFT/T-SAFT	Synthetic Aperture Focusing Technique/Tandem-Synthetic Aperture Focusing Technique
SB	Safety Basis
SST	Single-Shell Tank

T-SAFT	Tandem-Synthetic Aperture Focusing Technique
TBD	To Be Determined
TIP	Tank Integrity Project
TPA	Tri-Party Agreement, also known as the Hanford Federal Facility Agreement and Consent Order
TSD	Treatment, Storage and Disposal Facility under RCRA
TSIP	Tank Structural Integrity Panel
TSR	Technical Safety Requirement
TWINS	Tank Waste Information Network System
UT	Ultrasonic Testing
WAC	Washington Administrative Code
WFD	Waste Feed Delivery
WHC	Westinghouse Hanford Company

Acknowledgements

The IQRPE Team would like to acknowledge the following individual who provided significant input in the development of this plan.

Herbert S. Berman
of
Perot Systems Government Services

1. INTRODUCTION AND BACKGROUND

The mission of the Department of Energy (DOE) River Protection Project (RPP) is to store, retrieve, treat, and dispose of the highly radioactive Hanford tank waste in an environmentally sound, safe, and cost-effective manner (DOE/ORP-2000-10). The RPP mission requires providing and maintaining adequate tank capacity for waste storage and waste feed delivery (WFD). Thus, functional waste storage and transfer facilities are a key asset for the RPP. Current schedules require the Double Shell Tank (DST) System to be reliable through 2024.

Concerns related to aging of such facilities throughout the U.S. Department of Energy (DOE) complex led to the issuance of *Guidelines for the Development Structural Integrity Programs for DOE High Level Waste Storage Tanks, BNL-52527*. The committee of experts who developed these guidelines is commonly known as the Tank Structural Integrity Panel (TSIP). Structural integrity is defined in the TSIP guidelines BNL-52527 as including leak tightness (barriers to release of waste) and structural adequacy (strength against collapse or failure from normal and abnormal loads). The TSIP guidelines advocate a structured approach to assessing structural integrity as a basis for identifying necessary management options to ensure leak tightness and structural adequacy over the life of the mission.

Hanford tank waste is mostly contained in 149 single-shell tanks (SST), and 28 double-shell tanks (DST), with minor amounts in ancillary equipment (e.g., transfer piping, pits, other miscellaneous tanks). The design features, operational history, and structural capacity of the SSTs and DSTs are described in SD-TWR-RPT-002 *Structural Integrity and Potential Failure Modes of the Hanford High-Level Waste*. Failures in SSTs, generally attributed to stress-corrosion cracking, led to a decision by the U.S. Atomic Energy Commission (predecessor to the U.S. Energy Research and Development Administration and subsequently the DOE) in the 1960s, to replace the failing SSTs with DSTs that are of improved design, material selection, and construction. Liquids from SSTs continue to be transferred to DSTs as part of the SST stabilization program, which was completed in fiscal year (FY) 2004. Eventually, condensed solids and interstitial liquids (i.e., sludge and salt cake) in SSTs also are planned to be retrieved and transferred to DSTs for subsequent processing and disposal.

The DSTs and ancillary equipment are considered a Treatment, Storage and Disposal (TSD) unit, under regulations stemming from the *Resource Conservation and Recovery Act of 1976*. Configuration and operation of these facilities is regulated under Title 40, Code of Federal Regulations, Part 265, Subpart J, "Tank Systems" and *Washington Administrative Code* (WAC) 173-303-640, "Dangerous Waste Regulations, Tank Systems." These regulations require integrity assessments of tank systems that store dangerous waste and determination by an independent qualified registered professional engineer (IQRPE) as to whether the tank system is *leak tight, with adequate structural integrity and otherwise fit for use over the life of the mission.*

1.1. Purpose

The purpose of this plan is to delineate the activities, reviews, analyses, evaluations and examinations necessary to support the development of the Double Shell Tank Integrity Assessment Report (DSTAR) to be issued on or before March 31, 2006, as required per Tri-Party Agreement Milestone M-48-14 (DOE 2001), which was developed from Administrative Order 1250/1251. This plan also supports integrity assessment requirements for permitting the DST System under the Dangerous Waste Regulations permitting process per WAC 173-303.

The information obtained from development of the DSTAR will also be useful for assessing the extended life expectations of the DSTs and their structural adequacy for compliance with programmatic needs and mission requirements.

1.2. Scope

1.2.1. System Definition

This plan describes activities, reviews, analyses, evaluations and examinations necessary to perform an adequate integrity assessment of the DST System. The DST System is defined by M-48-01 (DOE 2001) and will be further defined in updated revisions of document, RPP-10250, *Double Shell Tank Transfer System Modifications Project E-525 Pre-Conceptual Decisions Summary*, which will contain descriptions and diagrams defining the DST System, as it will be configured by June 30, 2005. Only those post-June 2005 DST subsystems will be considered for integrity assessment. Table C-1 of Appendix C is a list of all applicable components within the DST System. The table indicates which components will be assessed, their method of assessment, inspection reports, etc. It also references current assessment documents, if any, that exist for that component. The table will be included in the DSTAR and updated with appropriate references to applicable documents and will have a reference for each applicable component with regard to its assessment document, paragraph, or section. It is intended that the table ultimately serve as a type of compliance matrix for the assessment of each applicable component. For completeness, some components are listed that will not be assessed. This is simply to make it clear that it is recognized that the component does exist in the DST System, but for noted reasons will not be included in this assessment.

It is important to note that some transfer lines, based on the configuration of their secondary encasements, are considered non-compliant as required per WAC 173-303-640, "Tank Systems." The secondary encasements of these non-compliant transfer lines are not continuous through pits or structures at either end of the line. This leaves the end portions of these primary transfer lines vulnerable to leakage to the environment.

Because the design of these lines does not meet the intent of prevailing design requirements for high-level mixed waste transfer systems, these lines will be excluded from the integrity assessment. Any future use and operation of these lines will be dependant upon receipt of a variance from the Washington State Department of Ecology (Ecology).

It should be noted that if the granting of a variance per Ecology publication #95-420 occurs, this will change the requirements to which these lines must comply, making them administratively compliant. In this case, the lines will be assessed within the bounds of the limitations and requirements set forth in the variance documentation.

1.2.2. DST Integrity Assessment Report Content

Milestone M-48-14 states that the "...Integrity Assessment Report shall document, at a minimum, all information gathered for the Double-Shell Tank System to meet the requirements of Title 40 Code of Federal Regulations (CFR) Subpart J, Part 265.191 (1), (2), (3), (4), (5)(i), and (5)(ii)." The milestone description further delineates specific content requirements for each paragraph listed. This plan describes those documents, reviews, evaluations, studies, etc., necessary to address DSTAR content requirements set forth in TPA Milestone M-48-14.

2. APPROACH

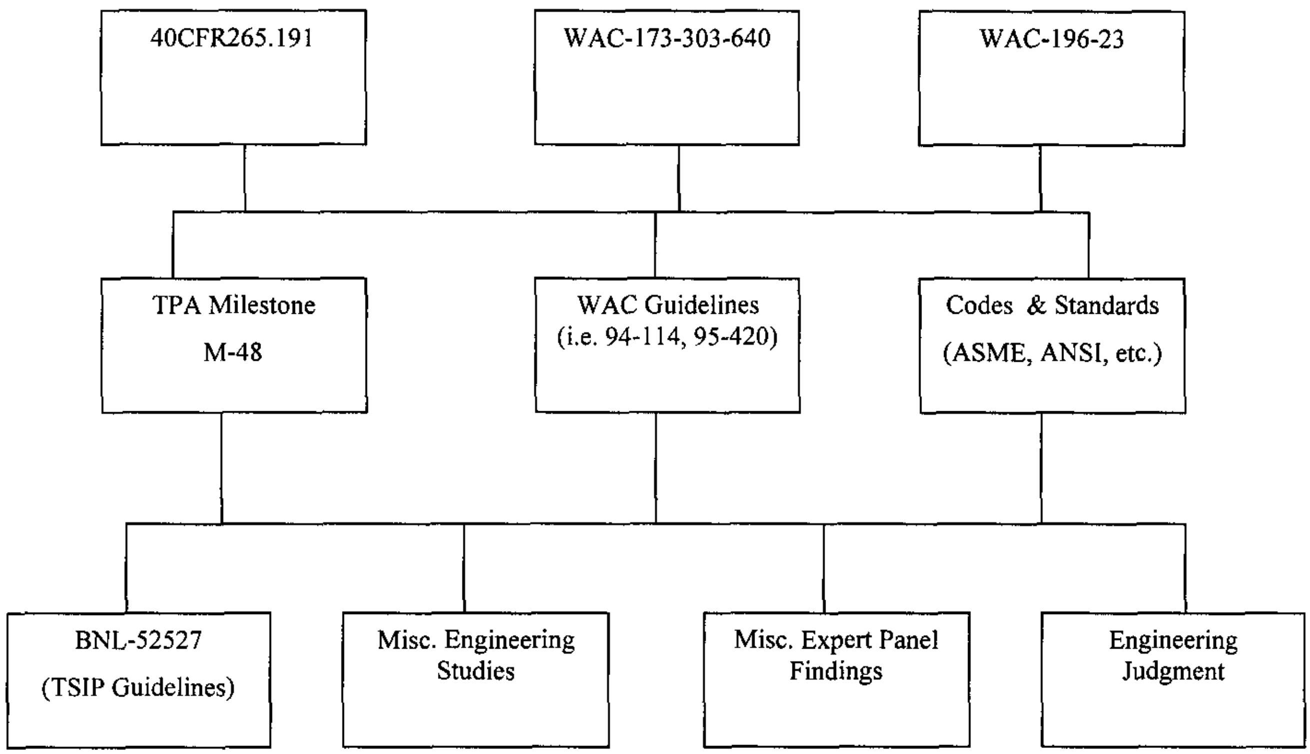
2.1. DSTAR Format and Content

The format of this plan is based on key points specified in WAC 173-303-640(2), "Assessment of Existing Tank Systems." Appendix A contains a WAC 173-303-640(2) compliance matrix that was used to guide the development of this plan. The matrix will be updated and provided as an appendix to the DSTAR as well. The matrix will ultimately provide for an "at-a-glance" verification of compliance, including cross-reference to the document or documents that demonstrate meeting the requirements.

The DSTAR format will follow the guidance provided in Ecology Publication 94-114, *Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste*, Section 2.8, as well as M-48-14 requirements.

This plan considers Ecology Publication 94-114 guidelines as the minimum attributes for compliance with WAC 173-303-640(2). Where this plan or the DSTIP program deviates from these guidelines, technical justification will be provided. Figure 1, Requirements Hierarchy, provides a graphical representation of the requirements hierarchy used in the development of this plan.

Figure 1. Requirements Hierarchy



Program, RPP-7574, *Double Shell Tank Integrity Program Plan* was written, which provides a comprehensive plan of activities for assessing the integrity of the DST System. The compliance matrix provided in Appendix A lists which of those activities meets the intent of WAC 173-303-640(2). Appendix B provides a compliance matrix against the BNL-52577, TSIP guidelines. This plan hereby accepts those activities as having value with regard to moving the project toward compliance with the regulations. This plan will primarily provide additional activities that must be performed in order to develop the DSTAR. Some current activities in the program plan are emphasized, based on their importance to the goal of issuing a plan that meets the regulation. These tasks are considered necessary and sufficient to meet the intent of Washington State Law, guidelines, and will provide the technical confidence necessary for the IQRPE to apply his certification stamp and statement to the DSTAR.

2.2. DSTAR Development

The integrity assessment shall be performed by addressing each task identified within this plan and then generating a final DST Integrity Assessment Report for release by March 31, 2006. By the time this plan is issued, a number of inspection reports and other assessments will have been issued. Each of these reports will need to be evaluated and activities identified, if necessary, which will allow those reports to be retroactively certified along with issue of the final DSTAR.

2.3. Assumptions

1. [Assumption Deleted] The revision 0 and revision 1 assumption on the potential use of prior integrity assessment reports is being deleted. Previous integrity assessment reports have been reviewed and found to not contain the level of detail and rigor equivalent to that planned for the DSTAR. Therefore, each will only be used for reference if needed.

2. [Assumption Deleted] The revision 0 and revision 1 assumption on the evaluation of prior integrity assessments using the requirements in effect at the time of the assessment is being deleted, since per deleted item 1 above, it will not be used.

3. Where instrumentation, inspection, or other equipment is employed, it shall be fully tested, qualified, and field hardened such that data is reliable.

4. Inspection data provided by others shall be certified as being complete and accurate by qualified individuals.

5. DST configuration and operation shall be in accordance with the Tank Farms RPP-13033, Documented Safety Analysis (DSA)

2.4. DSTAR Certification

It is impractical, if not, impossible to inspect the existing DST Systems to the extent that no uncertainty remains. The DST Systems are designed in general to doubly confine/contain the radioactive (dangerous) waste, while minimizing radiation exposure to the passerby through burial beneath several feet of soil. Current technology for inspection of buried systems is limited and can only provide a general idea of how the materials are withstanding the test of time. Inspecting/monitoring the systems through a variety of methods (i.e. ultrasonic testing (UT), visual, dome settlement, etc.) provides reasonable due diligence and enough information to presume that the systems will or will not function for the remainder of their design life, and possibly beyond. Given the limits of technology and policies of limiting personnel hazard exposure (ALARA), the IQRPE "fit-for-use" declaration can only mean that the systems are presumed to be fit based on the limited data that can be reasonably obtained. Since the systems are double contained and leak detection systems maintained operable per the facility authorization basis (DSA), this level of uncertainty with regard to their condition is considered acceptable.

The DSTAR will be certified by an Independent Qualified Registered Professional Engineer (IQRPE) as required per WAC 173-303-640(2). The certification shall read as follows:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and all attachments, and that, based on my assessment of the plans and procedures utilized for obtaining this information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The certification shall be applicable within the bounds of the assumptions and conclusions of the DSTAR such that:

1. The tank system is adequately designed
2. The tank system has sufficient structural strength
3. The tank system has compatibility with the waste to be treated or stored.
4. The tank system will not collapse, rupture, or fail.

While WAC 173-303-640(2) requires certification as described above, compliance with WAC 196-23-020, "Seal/Stamp Usage," WAC 196-23-030, Providing Direct Supervision," and *Revised Code of Washington* (RCW) 18.43.070, "Certificates and Seals" is also appropriate.

RCW 18.43.070 states, "*...signature and stamping shall constitute certification by the registrant that the same was prepared by or under his or her direct supervision and that to his or her knowledge and belief the same was prepared in accordance with the requirements of the statute...*"

WAC 196-23-030 defines direct supervision as "*...a combination of activities by which a licensee maintains control over those decisions that are the basis for the finding, conclusions, analysis, rationale, details, and judgments that are embodied in the development and preparation of engineering ...plans, specifications, plats, reports, and related activities. ...Direct supervision requires providing personal direction, oversight, inspection, observation and supervision of the work being certified.*" The code also refers to the types of communications that may be maintained between the licensee and those performing work with the provision that "*...the licensee retains, maintains, and asserts continuing control and judgment.*"

In compliance with these regulations, the IQRPE will be required to maintain a direct supervisory role over the development of the DSTAR or any other document the IQRPE is required to certify with the professional engineer's stamp/seal.

In addition, this plan bears the stamp of the IQRPE, since it was prepared using engineering judgment and specifies engineering related criteria in accordance with the prevailing laws related to registered professional engineers in the State of Washington.

2.5. Conclusions and Recommendations

The current integrity assessment program (RPP-7574) will not have gathered an adequate amount of data for certification of the DST Systems in 2006. Therefore, several additional activities have been identified. Table 2-1 provides a comprehensive list of tasks that will result in generating the necessary remaining data, evaluations, tests, examinations, and analyses to certify the DST Systems via the DSTAR on March 31, 2006. New tasks as well as baseline tasks are listed and identified.

It is recommended that these activities be incorporated/confirmed into the DSTIP master schedule, in accordance with Section 7.0 of this document.

Table 2-1. Summary of DST System Integrity Assessment Activities (5 pages).

Task	Description of Activity	Ref. Section	Summary of Activity	Associated Regulation or Requirement Supported	Baseline /New	Schedule Completion Date
1	Determine the age and remaining useful life	3.2	This task is rolled into the results of several other tasks, namely 3, 7A, an 7B.	WAC 173-303-640(2)(c)(iv)	Baseline	3/31/06
2	Assess data acquisition processes	3.3	Several data acquisitions processes are involved in the DSTIP. Methods of data acquisitioning and processing must be assessed from a quality standpoint.	M-48-14	Baseline	9/30/03 (Completed)
3	Develop a representative DST thermal and loading model	3.4	A three-dimensional model in ANSYS is developed, which includes soil modeling. The model is used to determine the structural adequacy of design.	WAC 173-303-640(2)	Baseline	12/30/05
4A	Develop and implement a program for leak test of catch tanks and DCRTs	4.1	Catch tanks in service beyond June 30, 2005 must have a leak test program associated with each. At the present time, no currently existing catch tank is scheduled to be in service beyond June 30, 2005	WAC 173-303-640(2)(c)(v)(A)	New	9/30/05 (Completed)
4B	Develop and implement a program for periodic leak testing of transfer line encasements	4.1	Leak testing is considered the most effective means of determining integrity of a buried line. Each piping system will require a leak check prior to release of the DSTAR – otherwise, removed	WAC 173-303-640(2)(c)(v)(B)	New	12/30/05

Table 2-1. Summary of DST System Integrity Assessment Activities (5 pages).

Task	Description of Activity	Ref. Section	Summary of Activity	Associated Regulation or Requirement Supported	Baseline /New	Schedule Completion Date
			from service. Thereafter, an evaluation should be performed to determine a plan and schedule for periodic leak testing of these lines.			
5A	Perform 20 Foot circumference UT examinations in accordance with M-48-14	4.2.1	The current DSTIP program, in compliance with M-48-14 (WDOE 1994), requires 20 foot sections of the exterior primary tank wall be UT examined	WAC 173-303-640(2)(c)(v)(B), 94-114, Section 2.1; M-48-14; 40CFR 265.191(5)(i)	Baseline	12/30/05
5B	Document the basis for the statistical validity of current sample populations	4.2.1	Statistically an argument must be made that the surface areas planned for examination in tasks such as 5A is a representative sample	94-114, Section 2.1; M-48-14	New	12/30/05 (Completed)
5C	Perform UT Examination on DST secondary liner	4.2.1	Three tanks to receive UT examinations. All 28 tank secondary liners receive video inspections.	94-114, Section 2.4	Baseline	9/30/05
5D	Evaluate DST secondary liner issues	4.2.1	Evaluate and develop a path-forward on certain issues with regard to the construction and commissioning of the secondary tank structure.	94-114, Section 2.4	New	12/16/04 (Completed)
5E	Perform internal and external video examinations of DSTs	4.2.1	All 28 tanks to receive video inspection of the internal primary tank, as well as the external pimary tank via annulus riser access.	94-114, Section 2.1	Baseline	12/30/05
6A	Assess Concrete Pits and Walls	4.2.2.1	The interior surfaces of concrete pits must be assessed for cracks,	95-420	Baseline	9/30/05

Table 2-1. Summary of DST System Integrity Assessment Activities (5 pages).

Task	Description of Activity	Ref. Section	Summary of Activity	Associated Regulation or Requirement Supported	Baseline /New	Schedule Completion Date
			spalls and other conditions, which may result in a release to the environment. The assessment should be performed in accordance with Ecology publication #95-420. Project W-314 is currently performing activities that address this task			
6B	Periodic Inspection of Coatings	4.2.2.1	A plan must be prepared and approved by the W-314 IQRPE for a re-inspection program and periodicity for the refurbished pits.	95-420; 94-114, Section 2.4	Baseline	12/30/05
7A	Assess Active Underground Transfer piping	4.2.2.2	Document an investigation and evaluation of alternate technologies, which permit assessment of a large portion of the pipe length, while only uncovering small portions of the pipe.	94-114, Section 2.4	New	12/30/05
7B	Inspection of Underground Transfer Piping	4.2.2.2	Perform video inspection of five transfer lines. Alternately, obtain samples of the piping from decommissioned lines planned for removal by various projects.	94-114, Section 2.3	New	12/30/05
7C	Assess Drain Lines	4.2.2.2	Review the designs and service dates of applicable drain lines.	94-114, Section 2.4	New	12/30/05
8A	Assess and resolve Effects of Couplant Fluids	4.2.3	Water is being used as the couplant for transmitting the ultrasonic transducer vibrations to the base metal (and back), and there does not appear to be any	M-48-14	New	9/30/04

Table 2-1. Summary of DST System Integrity Assessment Activities (5 pages).

Task	Description of Activity	Ref. Section	Summary of Activity	Associated Regulation or Requirement Supported	Baseline /New	Schedule Completion Date
			provisions for removal of that water, following each inspection. This water may accelerate corrosion at the tank bottom.			
9A	Qualification of Individuals	4.2.4	Certifications of individuals supporting inspections of DSTs, piping, and ancillary integrity assessments must be documented and included within the integrity assessment reports.	WAC 173-303-640(3)(a)(iii), 94-114, Section 3.6; 40CFR265.191(b)(3)	Baseline	3/31/06
10A	Review historical excursions	5.1.1	Attempt to document and assess excursions, if any, when the DST Systems were outside of operating parameters	94-114, Section 2.2; WAC 173-303-640(2)(a)(c); 40CFR265.191(b)(2)	New	12/30/05
10B	Assess the effect of contacted waste on DST system materials	5.1.2	Current practices, that bring dangerous/hazardous wastes into contact with the DST System materials, must be reviewed and evaluated.	94-114, Section 2.2; WAC 173-303-640(2)(a)(c); 40CFR265.191(b)(2)	New	12/30/05
10C	Evaluate and document worst case transfer and storage projections	5.1.3	Review future transfer plans in an effort to determine the corrosive, and possibly erosive, nature of waste products planned for transfer or storage in the DST Systems.	94-114, Section 2.2; WAC 173-303-640(2)(a)(c); 40CFR265.191(b)(2)	New	12/30/05
11A	Assess the condition of existing cathodic protection systems	6.1	The need for and/or condition of existing cathodic protection systems must also be assessed.	94-114, Section 2.5; WAC 173-303-640(2)(c)(iii); 40CFR265.191(b)(3)	New	3/31/06
12A	Assess the current corrosion monitoring program	6.1.1	An assessment of the current corrosion monitoring program must be performed to address	40CFR265.191(b)(3); WAC 173-303-640(2)(c)(iii)	Baseline	3/31/06

Table 2-1. Summary of DST System Integrity Assessment Activities (5 pages).

Task	Description of Activity	Ref. Section	Summary of Activity	Associated Regulation or Requirement Supported	Baseline /New	Schedule Completion Date
			many points associated with the present operations and inspection programs associated with the DSTs			
12B	Develop ongoing inspection program recommendation	6.1.2	A program for ongoing inspections beyond the release of the DSTAR must be developed.	94-114	Baseline	3/31/06
13A	Assess the existing corrosion control program	6.2.1	It must be determined whether the current administrative controls regarding corrosion monitoring, inspections, chemical controls and treatments, and integrity assessments, are adequate.	94-114, Section 2.2; WAC 173-303-640(2)(a)(c); 40CFR265.191(b)(2)	Baseline	3/31/06
14A	Develop dome deflection survey program	6.2.2	Monitoring tank settlement should be implemented.	94-114, Section 2.8; WAC 173-303-640(2)(a)	New	12/30/05
14B	Develop DST System loading control program	6.2.2	Some lines cross roads outside of the tank farms, or high vehicle traffic areas in and out of the tank farms. Each of these lines needs to be identified, classified and analyzed (if previous analysis is inadequate or cannot be located) for potential loads	WAC 173-303-640(2)(c)	New	10/28/04 Complete

3. ADEQUACY OF DESIGN

3.1. Design Standards

Each tank system was designed to some accepted code or standard(s) in effect at the time. WAC 173-303-640(2)(c)(i) requires that an integrity assessment consider the design standards used in the design and construction of the tank system.

Several documents have been issued that identify design standards used in the construction and design of the Hanford tank systems (e.g. SD-WM-DGS-003, *Structural Acceptance Criteria for the Evaluation of Existing Double Shell Tank Waste Storage Tanks Located at the Hanford Site, Richland Washington*). Additional documentation is being prepared in the course of the PNNL Thermal and Seismic Loading Analysis Project, which will provide a validated, current technology stress analysis for the DSTs (see section 3.4 of this report). While this documentation for the tanks is abundant, pedigreed research into such standards for transfer lines, pits, catch-tanks, and double-contained receiver tanks (DCRT) is sparse at best. Additional research and documentation needs to be developed in order to provide a complete description of the design standards used for the existing DST System as a whole. The scope of the activity must include all transfer lines, pits, catch tanks, and DCRTs, which will exist in the DST System after June 30, 2005. Each evaluation document which addresses, to the extent possible, adequacy of design shall provide a thorough description of the materials used in construction, construction methods employed, quality control, and testing performed on materials, and the final structure, prior to being placed in service. The evaluation shall also address all available engineering codes referenced for construction, design operating specifications, and a presentation of all available calculations employed to determine each structure's design strength, and projected useful life. Where archived codes are not available, current, equivalent codes will be used.

In addition to documenting codes and standards used in the original design, the following codes and standards will be utilized in evaluating the adequacy of the DST System design as it stands today. Applicable portions of these codes and standards will be the primary means of evaluating fitness for use as they apply to each case. Comparison of these present day standards with the standards in effect at the time of construction will be evaluated for any safety or significance.

3.1.1. Hanford/DOE Codes and Standards

BNL-52527, 1997, *Guidelines for Development of Structural Integrity Programs for DOE High-Level Waste Storage Tanks*, Brookhaven National Laboratory, Upton, New York.

DOE-STD-1020-02, 2002, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities,* U.S. Department of Energy, Washington D.C.

DOE-HNDBK-1132-99, *DOE Handbook: Design Considerations*, U.S. Department of Energy, Washington D.C. (content formerly contained in DOE O 6430.1A)

3.1.2. Washington State Codes, Standards, and Guides

Ecology Publication 94-114, 1994, *Guidance for Assessment and Certifying Tank Systems that Store and Treat Dangerous Waste*, Washington State Department of Ecology, Olympia, Washington.

Ecology Publication 95-420, 1995, *Guidance for Assessing Dangerous Waste Secondary Containment Systems,* Washington State Department of Ecology, Olympia, Washington.

WAC 173-303-640, "Dangerous Waste Regulations, Tank Systems," *Washington Administrative Code*, as amended.

WAC 173-303-810, "Dangerous Waste Regulations, General Permit Conditions," *Washington Administrative Code*, as amended.

3.1.3. National Codes and Standards

ASME B31.1, 1998, *Power Piping*, American Society of Mechanical Engineers, New York, New York.

ASME B31.3, 1999, *Process Piping*, American Society of Mechanical Engineers, New York, New York.

ASME Section III, 2001, Boiler and Pressure Vessel Code, *Rules for Construction of Nuclear Power Plant Components*, American Society of Mechanical Engineers, New York, New York.

ASME Section VIII, 2001, Boiler and Pressure Vessel Code, *Rules for Construction of Pressure Vessels*, American Society of Mechanical Engineers, New York, New York.

ACI 318-02, 2002, *Building Code Requirements for Structural Concrete*, American Concrete Institute, Detroit Michigan.

ACI 349-01, 2001, *Code Requirements for Nuclear Safety-Related Concrete Structures*, American Concrete Institute, Detroit Michigan.

ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers, New York, New York.

API 650, 1998, *Welded Steel Tanks for Oil Storage*, American Petroleum Institute, Washington D.C.

API 653, 2001, *Tank Inspection, Repair, Alteration and Reconstruction*, American Petroleum Institute, Washington D.C.

API 510, 1997, *Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair and Alteration*, American Petroleum Institute, Washington D.C.

API 579, 2000, *Fitness for Service*, American Petroleum Institute, Washington D.C.

RP0193-2001, *External Cathodic Protection of On-Grade Metallic Storage Tank Bottoms,* , National Association of Corrosion Engineers, Houston, Texas

RP0169-2002, *Control of External Corrosion on Underground or Submerged Metallic Piping Systems,* , National Association of Corrosion Engineers, Houston, Texas

3.2. Age of the System

WAC 173-303-640(2)(c)(iv) requires that an integrity assessment consider the documented age of the tank system. Several documents have been issued which include construction dates for each tank farm. These include:

- SD-WM-ER-556, Double Shell Tank Useful Life Analysis
- SD-WM-ER-585, Double Shell Tank Remaining Useful Life Estimates
- SD-TWR-RPT-002, Structural Integrity and Potential Failure Modes of Hanford High Level Waste Tanks.

It is apparent that since the tanks, pits and transfer systems had to be in place before the tanks themselves could be placed into service, then they can all be considered to be relatively the same age. There are a few exceptions where new lines have been installed or replaced.

Integrity Assessment Task 1 – Determine the Age and Remaining Useful Life

An effort will be required to research and document the age of each transfer line, pit, catch tank, and DCRT, which will exist in the DST System following June 30, 2005. While the remaining useful life is not directly related to a regulatory requirement, the IQRPE requires this information in order to properly certify the DST System. The age of each active component of the DST System, including the DSTs and their ancillary equipment, shall be provided to within one year of their completed construction date.

With knowledge of the age of the system and its present condition (through examinations, testing, etc.), an estimate of the current mission life of the system shall be documented. For each DST System, the evaluation of the remaining useful life shall be based on some combination of all applicable ultrasonic data gathered, waste compatibility with the materials of construction, history of corrosion protection, operational history, visual examinations, and any other sources of tank integrity assessment information gathered. This evaluation shall include, at a minimum, a tabular listing by component equipment number, of all tanks, transfer pipelines, and pits within the DST System, describing the materials of construction, and compliance with secondary containment requirements.

3.3. Quality Assurance and Engineering Procedures

As described in section 3.1 (and M-48-14), as well as Section 4.2.3 of this document, the quality control procedures followed at the time of original construction are relevant to determining the system's fitness for use.

<u>Integrity Assessment Task 2 – Assess Data Acquisition Processes</u>

Where records are reasonably available, each applicable project's historical QA records shall be independently assessed by the IQRPE Team in an effort to determine:

1. Whether the quality assurance requirements in place at the time were adequate to ensure the necessary level of engineering rigor, which would result in a competent design; and
2. Whether those quality assurance procedures were followed.

Where post project QA audits were performed, those audit reports may be the only review required, as deemed necessary by the independent QA auditor.

Large amounts of data will be obtained, cataloged and reviewed in an effort to provide the necessary basis for certification of the DST System as fit for use. These data must be obtained with data quality objectives in mind, with a proper level of rigor in the development and maintenance of documentation. An independent Quality Assurance review shall be performed on current data acquisition, reporting, and archiving processes to ensure the necessary and sufficient level of traceability is maintained.

3.4. Tank Modeling

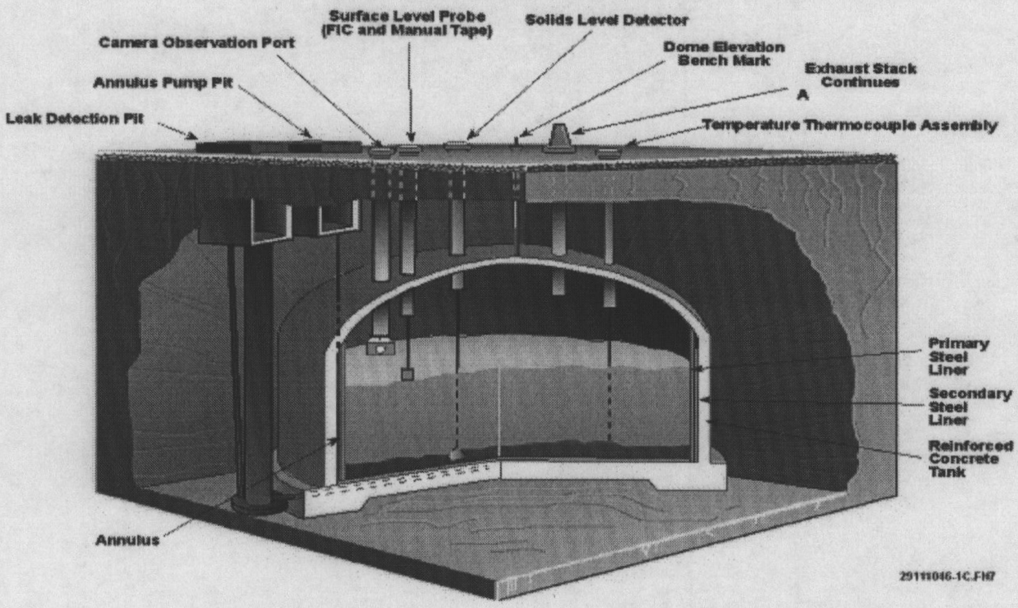
Integrity Assessment Task 3 – Develop a Representative DST Thermal and Loading Model

Assessment of the structural integrity of existing DSTs storing dangerous waste is required per WAC 173-303-640 (2) Tank Systems. The purpose of this effort is to assess the adequacy of DST design, and determine whether they have sufficient structural strength to ensure they will not collapse, rupture or fail. The assessment must consider as a minimum, the design standards according to which the DSTs were constructed.

To meet WAC requirements, structural assessments were performed by modeling the tanks with Finite Element computer codes. These codes calculated forces, moments, deflections and stresses in DST models due to normal, operational and seismic loads. The calculated results were evaluated against acceptance criteria defined in the tank design standards. Two different design standards were used for the internal primary steel tank and the secondary steel liner of the DSTs. They were either ASME Section VIII Division 2 or ASME Section III. The steel tanks/liners were not code stamped. The outer concrete shell design codes are ACI 318 and ACI 349. Tanks were designed in accordance with the version of the codes in effect at the time. While not explicitly required by the ASME or ACI codes, the primary steel tank was also evaluated against a stress corrosion cracking criterion.

The DSTs are 83 ft in external diameter (including the concrete shell) and constructed of reinforced concrete with a steel internal primary tank and secondary liner. These buried underground tanks, shown in Figure 2, are cylindrical in shape with a dome roof. The height of the tanks is approximately 47 ft above the base mat and the minimum soil overburden is 6-1/2 ft at the crown. The welded primary carbon steel tank consists of the base and wall, which rests upon an 8-in. The primary tank provides the containment of the stored liquid wastes, and is separated from the secondary liner on the bottom by the refractory insulating concrete, and on the sides by an air gap. The secondary welded carbon steel liner is structurally integral with the inner surface of the cylindrical reinforced concrete tank wall (joined with embedded j-bolts) and rests upon the concrete base mat. The primary tank and the secondary liner are essentially structurally independent within the tanks. The purpose of the secondary steel liner/reinforced concrete tank is to establish a redundant leakage barrier.

Figure 2. Typical DST Configuration



Past structural modeling of the DSTs incorporated all or part of the above structural features. While the past structural modeling alone is not considered adequate for certification of the DST integrity, those activities will be discussed and described in brief for the sake of completeness. Work performed under this task (Task 3) is described in sections 3.4.1 to 3.4.5.

The Analysis of Record (AOR) for the DSTs consists of the original Blume analyses [ARH-R-85, *Seismic Analysis of Underground Waste Storage Tanks 241-AZ-101 & 102 Hanford Washington*, ARH-R-120, *Final Report, Strength and Stress Analysis for Waste Tank Structures at Hanford Washington*, ARH -R-172, *Analysis of Underground Waste Storage Tanks 241-SY at Hanford Washington*, and ARH -R-219, *Analysis of Underground Waste Storage Tanks 241-AW at Hanford Washington*] which were later revised per SD-WM-ANAL-033, *241-AP Waste Storage Tanks Supplemental Gravity Load Analysis*, SD-WM-ANAL-035, *241-AW/AN, Waste Storage Tanks Supplemental Gravity Load Analysis*, and SD-WM-ANAL-034, 241-AY/AZ, *Waste Storage Tanks Supplemental Gravity Load Analysis* to address unresolved questions due to increased soil density above the tanks. The Blume analysis demonstrated code compliance of the DSTs for normal loading with uniform and concentrated loads on the tanks, using the AXIDYN code for gravity hydrostatic, sloshing loads and seismic loads. Additionally, the SAP4 code was used to evaluate thermal expansion. Julyk used the ANSYS code in his revised analysis.

In 1994 an Accelerated Safety Analysis (ASA Phase I) was performed. The purpose of the analysis was to:

(1) Provide analytical methods for evaluating DSTs,
(2) Perform load sensitivity evaluations,

(3) Assess the tank farm operation specifications limits.

The DST configuration chosen for evaluation consisted of a combined model incorporating conservative features of 241-SY and 241-AY in the same model. The ANSYS computer code was used to perform the analysis. It used the 241-SY reinforced concrete walls, haunch and dome, rebar areas, and footing design. Features of the 241-AY included in the model were rebar in the footing and plate thickness in the primary tank and liner. A parametric study was run varying:

- Soil height and density,
- Waste level, temperature, and specific gravity,
- Vapor space and annulus pressure,
- Uniform and concentrated loads,
- Sub grade soil modulus.

The results were presented as maximum stress and change in stress from a baseline loading (and soil condition). The results identified loading conditions giving the highest stresses and evaluated the sensitivity of stresses in the tank structure to changes in loading.

In 1995 an Accelerated Safety analysis (ASA Phase II) was performed. This analysis extended the Phase I work, and addressed the potential for collapse of the upper concrete wall, haunch and dome of the tank. The tank configuration was the same as Phase I. Two major tasks were evaluated in Phase II, 1) determine the worst-case load combination for the DSTs and compare the results to the ACI 349 code allowable stresses, and 2) apply the maximum load combinations to the ASA model with the thermally degraded concrete properties and creep associated with the maximum temperature. The results of this analysis demonstrated that the maximum load combinations for the DSTs do not exceed ACI code limits in the dome, haunch and upper wall for normal loading. The normal loading included the soil overburden, uniform and concentrated live loads and elevated temperatures as limited by the Interim Operational Safety Requirements (IOSR) for standard and aging waste DSTs. The ACI methods were used to evaluate the concrete dome, haunch and wall, as defined in ACI 349 and the ASME Boiler and Pressure Vessel Code, Section III Division 2, Subsection CC.

An ASA Phase III evaluation was performed in 1996, and issued only as a draft, and will not be discussed herein. This unpublished analysis attempted to address many of the Phase II recommendations. The ASA Phase III evaluation may be used as a spring board for the current analysis.

Currently an effort is under way to perform additional structural analysis on the DSTs. The Analysis will be performed using the ANSYS Finite Element Computer Code.

Since the DSTs are similar in many respects with regard to design, a generic tank model incorporating bounding conservative design details will be employed. This approach is more cost effective than individual analysis of all 28 DSTs. Tanks 241-AY and 241-SY contain the bounding features of all 28 DSTs. The generic tank model will consist of modeling 241-AY tanks.

The ongoing work to be accomplished is described in the five planned Activities below.

3.4.1. Activity I — Thermal and Operating Loads Analysis

A structural analysis of the DST (primary steel tank and secondary reinforced concrete tank) shall be performed for the soil backfill in place assuming a uniform soil temperature. (i.e., free from thermal stress and at zero days of operation). The analysis shall determine the resulting stresses, strains and deformations in the primary steel tank and the secondary reinforced concrete tank. Additional nonlinear time-dependent analyses of the structure shall be conducted which calculate the effects of heating the concrete secondary tank to the maximum operating temperature, long-term operation at elevated temperatures, and operating temperature cycles. These analyses shall account for the degradation of modulus of elasticity, compressive strength, etc. in the concrete with extended exposure to elevated temperatures. Parametric studies over a range of concrete and soil properties will be conducted to evaluate the effects of the uncertainty and potential variability in these properties. The results shall predict time-dependent creep, cracking, stresses, strains and deformations for the entire structure.

3.4.2. Activity II – Seismic Analysis

An analysis shall be performed to evaluate the seismic response of the DSTs. The analysis shall incorporate 1) non-rigid response of the tank roof due to an earthquake, 2) the asymmetric seismic-induced soil loading 3) the structural discontinuity between the concrete tank wall and the support footing, 4) the discontinuity at the tank wall and haunch area, and 5) the interaction of the primary tank waste at elevated waste levels with the tank dome.

The seismic analysis shall consider the interaction of the tank with the surrounding soil, and the effects of the primary tank waste content. The geotechnical properties of the surrounding soils shall be based on data from previously conducted geophysical investigations at the Hanford Site, input from soil experts, and/or experts on buried structure soil interaction. The concrete tank elastic stiffness properties used in the seismic analysis shall be determined with consideration for the expected cracks in the concrete structure and reduced elastic properties due to elevated temperatures and thermal cycling, as predicted by the nonlinear, time-dependent analyses of the structure (Activity I above).

3.4.3. Activity III – Minimum Allowable Wall Thickness Analysis

An analysis shall be performed to determine the minimum allowable uniform wall thickness as a function of height, for the DST primary tank. The minimum allowable wall thickness determination shall be based on ASME Section VIII, Division 2, criteria.

3.4.4. Activity V – Buckling Analysis

A buckling analysis shall be performed to determine the maximum allowable differential pressure for the DST primary tank. The results of the analysis shall determine the margin of safety to prevent buckling in the potential event of overpressure in the tank annulus. The effects of varying waste level and initial tank fabrication imperfections shall be considered.

3.4.5. Conclusion

The above additional described activities (I thru V) combined with prior studies will fulfill the WAC requirements to assess structural adequacy of the DSTs.

4. STRUCTURAL INTEGRITY

According to WAC 173-303-640(2)(c)(v)(A), leak testing of tanks is required. For the double shell waste tanks, leak testing the tanks by filling them to some level and monitoring for leaks would generate inordinate quantities of waste. For this reason, testing of DST integrity is limited to a combination of visual inspections, leak detection, and other non-destructive test methods, such as ultrasonic testing (UT).

4.1. Testing

Integrity Assessment Task 4A – Develop and Implement a Program for Leak Test of Catch Tanks and DCRTs

For catch tanks and double-contained receiver tanks (CTs and DCRTs), leak testing is a viable option. Currently, on direction from Ecology, two CTs are undergoing yearly leak tests. These tests should continue until they are removed from service. Any existing CTs or DCRTs that will be in service beyond June 30, 2005 will be required to undergo leak testing on an annual basis for their integrity assessment certification. The yearly requirement is selected, based on current practice that arose from administrative orders from Ecology. However, the frequency may be revised, given that a solid technical basis is provided and approved by the IQRPE.

New CTs or DCRTs will be leak tested as a normal course of their commissioning. Integrity assessments will be performed per WAC 173-303-640(3) "Design and Installation of New Tank Systems or Components," which will also include a recommended schedule for inspections.

Integrity Assessment Task 4B – Develop and Implement a Program for Periodic Leak Testing of Transfer Lines

While WAC 173-303-640(2)(c)(v)(B) implies that leak testing of piping systems is only one method of integrity assessment. However, leak testing is considered the most effective means of determining integrity of a buried line. Each piping system encasement will require a leak check prior to release of the DSTAR. Thereafter, an evaluation should be performed to determine a plan and schedule for periodic leak checking of these lines. The plan must consider cost, benefit, and feasibility of nozzle-to-nozzle leak checking as opposed to encasement leak checking, or both. Unless otherwise noted herein, leak checking is only required on the secondary encasement. These checks should be performed per either of the following two options.

1. A pneumatic leak check may be performed to 110% of the design pressure, and held for a minimum of 30 minutes, with no more than a 5% drop in pressure. It is recommended that prior to the hold test, the system is held at pressure for 4 hours to allow for temperature equilibrium.

2. Where access ports on the secondary encasement are not available (or the encasement does not extend through the pit walls at the ends), a hydrostatic test on the **primary** line should be performed to 110% of the design pressure, and held for a minimum of 30 minutes, with no more than a 5% drop in pressure.

A hydrostatic test on the secondary encasement is not permitted. The concern is that dead space exists below the encasement drain tap. Test fluid may collect there and accelerate corrosion. See Figure 3.

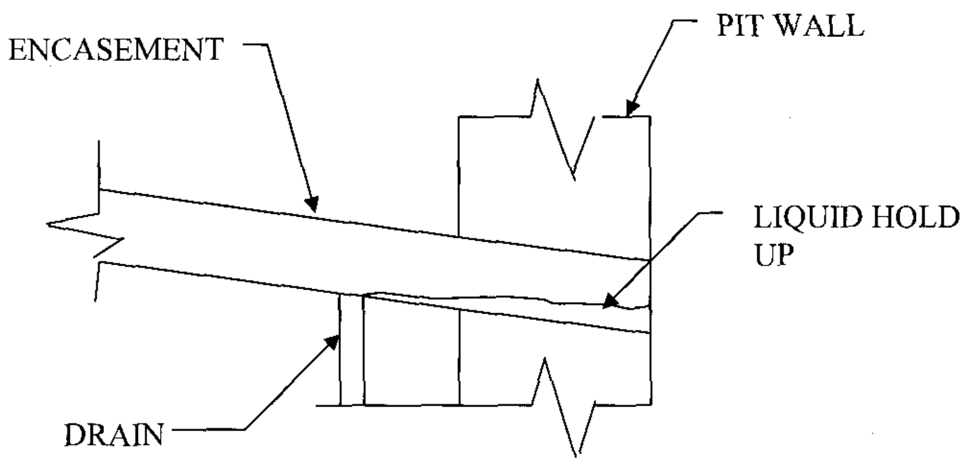


Figure 3 – Encasement Hold Up

In the event of any leak indication, the transfer line must be removed from service until the leakage site can be located and repaired, or it can be proven that the leak indication was false.

4.2. Examination

4.2.1. Examination of Tanks for Structural Integrity

Ecology publication 94-114, Section 2.1 states, "*The structural integrity of tanks storing dangerous wastes can be assessed by performing either leak testing or an external visual inspection in combination with another tank assessment method such as internal visual inspection, ultrasonic, magnetic particle and radiography inspections.*"

Several specialized remote inspection robotics and other equipment have been developed and implemented to enhance the DST assessment program (e.g. extended arm, UT crawler, etc.). Additionally, the Tandem Synthetic Aperture Focusing Technique (TSAFT) was developed to examine the tank lower knuckle for cracking.

Integrity Assessment Task 5A – Perform 20-foot Circumference UT Examinations in Accordance with M-48-14.

While Ecology guidelines per 95-420 imply full circumference examinations, TSIP guidelines (BNL-52527) require at least 5% of the circumference. The current DSTIP program, in compliance with M-48-14, requires 20 foot sections be UT examined which corresponds to about 8% of the circumference. In addition, the TSAFT previously mentioned includes the tank bottom knuckle, and internal/external video inspections provide inspection of much more surface area. Specifically, the examination scope required under the Tri-Party Agreement M-48 series milestones is as follows:

- 76 cm (30-in.)-wide vertical scan of the primary vertical tank wall for all DSTs
- 6 m (20-ft) length of circumferential weld joining the primary tank vertical wall to the lower knuckle and adjacent heat-affected zone for all DSTs
- 6 m (20-ft) length of vertical weld joining shell plate courses of the primary tank, extended as necessary to include at least 0.3 m (1 ft) of vertical weld in the nominally thinnest wall plate and adjacent heat-affected zones for all DSTs
- 6 m (20-ft)-long circumferential scan at a location in the vertical portion of the primary tank wall corresponding to a static liquid/vapor interface level that existed for any 5-year period, extending at least 0.3 m (1 ft) above that liquid/vapor interface for 6 DSTs
- 20-foot long circumferential scan of the predicted maximum stress region of the lower knuckle base metal of six (6) DST's. Tanks selected for examination will be recommended by DOE and will be subject to approval by Ecology. Findings and conclusions from this examination data may necessitate examination of additional DSTs in this area, or may be required upon review of the associated integrity assessment report by Ecology.
- Primary tank bottoms in each accessible air slot over a length of 3 m (10 ft), or to a length practical, toward the center of the tank from the lower knuckle joint for 6 DSTs (including Tank 241-AN-107, which was examined in FY 1998). Tanks selected for examination will be recommended by DOE and will be subject to approval by Ecology and the IQRPE. Findings and conclusions from this examination data may necessitate examination of additional DSTs in this area, or may be required upon review of the applicable Integrity Assessment Report by Ecology.

These activities are necessary to support the DSTAR and must continue until all designated tanks have been examined.

Integrity Assessment Task 5B – Document the Basis for the Statistical Representativeness of the Current Sample Populations

To verify the structural integrity of the tanks, portions of the tank primary shell liners are slated for examination in the existing CH2M HILL plan (see Appendix B). Statistically an argument must be made that the surface area planned for UT examination in Task 5A is a representative sample of the approximately 235-foot circumference of the tank. However, there are some basic assumptions made. The key assumption is that waste in a single tank is at least circumferentially homogenous and therefore, a circumferential sample of 20 feet, plus the 30 inch wide vertical UT scan would provide data representative of the entire tank. It has been shown that tank waste generally has a relatively homogeneous supernatant liquid above a precipitated solids (sludge) layer. The sludge layer may not be homogenous and the liquid-air-interface (LAI) (sometimes called the "waterline") and the vapor space above, represent different corrosion environments.

It may not be practical to examine the whole tank with UT inspections or some other program. However, sections of the tanks to be examined should be selected carefully to get either the best picture of the whole tank or to examine areas of concern. Appendix B describes the scope of the present UT and Visual inspections performed on the DSTs, compared to guidelines.

PNL, 2001, references the Tank Structural Integrity Panel (TSIP) guidelines (BNL 1997) that a minimum of 10% of the tanks (i.e., 3 DSTs) should be sampled. However, based on the TPA M-48 requirements, all 28 DSTs are to be examined. This reasoning is sound in that the tanks have different service dates, and different types of waste storage history and have not seen the same wear and usage. Therefore, it is considered prudent that all tanks are examined with UT and video techniques.

The statistical basis for uncovering five (5) diameters of buried piping (10 linear inches for a 2 inch transfer line) was not found in any documentation reviewed to date. Without a discussion and firm foundation of how this sampling parameter was derived, it raises questions as to its validity.

It seems reasonable that the length of transfer lines should be considered in any sampling analysis. Transfer piping varies greatly in length, which would suggest that an analysis of five diameters might be reasonable for one length of transfer piping but would not be enough for a longer length.

With the use of current methodologies, five diameters may be enough piping to assess general corrosion. However, elbows and bends in the transfer line would be exposed to additional corrosion factors. Five diameters of piping may not be enough to measure these affects, and some number of elbows and bends may have to be evaluated separately.

While the current programmatic commitments have value, an activity must be established to investigate and document the statistical validity of performing the present scope of UT examinations (e.g., 20 feet x 15 inches rather than the entire tank circumference), as well as establishing the validity of examining five diameters of transfer piping. This analysis should utilize accepted statistical modeling techniques and applicable standards. Previously prepared analyses may be utilized and validated for applicability in lieu of generating new analyses.

Integrity Assessment Task 5C – Assess DST Secondary Liners

Publication 94-114 also states, "*[the purpose of secondary containment] is to prevent the release of dangerous waste or dangerous constituents to the environment...secondary containment must consist of either; 1) an external liner, 2) a concrete vault, 3) a double walled tank, or (4) "an equivalent device" as approved by Ecology (WAC 173-303-640(4)(d))...Dangerous waste regulations define "tank system" to include the containment system associated with a tank used for storing or treating dangerous waste (WAC 173-303-040). Therefore, a tank system integrity assessment must include an integrity assessment of its associated secondary containment system.*"

Non-Destructive Examinations (UT) are currently planned for the secondary liners of three tanks, and visual examinations are being performed on each of the 28 DSTs. Results of the evaluation performed in Task 5D may allow for examination of fewer tanks. Otherwise, no further effort is required on this task other than those currently planned per RPP-7574.

Integrity Assessment Task 5D – Evaluate DST Secondary Liner Issues

The DSTIP has recently included assessment of the secondary tank in their programs (RPP-7574). While these assessments should continue as planned, an additional activity must be established to evaluate and develop a path-forward on certain issues with regard to the construction and commissioning of the secondary tank structure.

Issue #1: The secondary liner welds were radiographed. There are conflicting reports as to what level the welds were examined and the types of methods used. One document (SD-WM-DGS-003) states that these welds were only radiographed to the 27 foot (324 inches) level, while the AN Farm construction specification (B-130-C4) indicates inspection to the upper knuckle weld. The level and types of examinations may not be sufficient if a failure of the primary tank could result in a higher level than that which was examined.

Issue #2: The secondary tank structures were never hydrostatically leak tested to *any* level.

The evaluation of these issues must consider and document:

- Likelihood of a leak above the upper-most examined weld
- Ability to mitigate a leak before the upper-most examined weld level is reached
- The feasibility/practicality of an equivalent inspection or test above the upper-most examined weld should it be required.

Integrity Assessment Task 5E – Perform Internal and External Video Examinations of DSTs

Publication 94-114 (Section 2.1) states, "*...An external visual inspection should be performed to identify any major and obvious deficiencies, such as significant cracking in the tank wall that would require the tank system to be designated as unfit-for-use and taken out of service.*" Further, "*...An external visual inspection cannot be used by itself as a sole method of verifying that a tank system has adequate structural integrity and can continue to remain in use.*"

Video examinations are currently performed within both the primary and annulus tank spaces on the DSTs. Video examinations within the annulus are performed at four "corners" of each tank in an effort to obtain complete coverage of the annulus. Annulus videos must include both imaging of the external primary wall and the internal wall of the secondary liners. Primary tank internal videos are performed through one riser and include 360-degree coverage of the surfaces above the waste supernatant level.

These video examinations must be performed periodically on all 28 DSTs, and the present program requires this on a 5 to 7 year interval. The results of each video inspection must drive the strategy for UT inspection with respect to where to deploy the equipment and the locations upon which to focus the inspection.

Each video examination must check for:

- Evidence of excessive or uneven settlement of the tank such as distortion or buckling of the tank liner,

- Rust, pitting and other visual evidence of corrosion on the exterior the primary and secondary liner especially at roof areas and connections,

- Cracks or evidence of leaks at joints and welds, especially at connections,

- Apparent loss of metal thickness on the tank bottom and sides.

A video inspection report shall be written or reviewed by an engineer or certified inspector, either of which must be qualified in visual inspection of tanks. The report must flag above-mentioned issues for possible quantification during subsequent UT examinations. It is unnecessary to document the entire video inspection with video still captures. Only areas of concern need be captured and annotated. The report must also locate areas of concern based on north-south directional coordinates as well as approximate vertical position on the tank wall.

4.2.2. Examination of Ancillary Equipment of Structural Integrity

Ecology publication 94-114 (Section 2.3) states, "*A significant cause of releases is failure of ancillary equipment, including failures of piping, pumps, flanges and couplings. The integrity of piping and other ancillary equipment* ***must be*** *assessed using leak testing or another appropriate method such as radiography (WAC 173—303-460(2)(c)(v)(B)). Also check piping connections and penetrations through tanks and secondary containment structures.*"

Ecology publication 94-114 (Section 3.5) also states that "*the ancillary equipment must be designed to be supported and protected against damage and excessive stress due to excessive settlement, vibration, expansion, or contraction (WAC 173-303-640 (3) (f). ..... Ancillary equipment that is not visually inspected for leaks on a daily basis must be designed and installed with secondary containment (WAC 173-303-640 (4) (f).*"

4.2.2.1. Concrete Pits and Vaults

Ecology publication 94-114 states, "*The interior and exterior surface of concrete vaults and other concrete structures used for secondary containment should be assessed for cracks, spalls and other conditions which may result in a release to the environment.*"

<u>Integrity Assessment Task 6A – Assessment of Concrete Pits and Vaults</u>

While assessment of the exterior surface of a buried pit is impractical, the interior surfaces of concrete pits must be assessed for cracks, spalls and other conditions, which may result in a release to the environment. The assessment should be performed in accordance with Ecology publication #95-420. Project W-314 is currently performing activities that address this task for the majority of pits. However, a small number of pits have not been included in the W-314 scope, which must be assessed and refurbished as necessary. These pits are 241-AP-02D, 241-AP-VP, and the steel liners in the 6241-A Diversion Box and the 6241-V Vent Station.

Video examination of the pit interiors must look for at a minimum:

- Significant cracks or spalling in concrete pads,
- Evidence of deterioration of exterior coatings such as rust spots and blisters,
- Damage to any insulation being used,
- Evidence of possible leaks around the tank or ancillary equipment such as discoloration of coatings,
- Evidence of chemical attack caused by reaction of concrete structures with waste transferred through the jumper systems.

Video/photo examination of steel liners must look for at a minimum:

- Evidence of erosion/corrosion,
- Evidence of cracking or pitting,
- Punctures or penetrations of any kind that would allow leakage through the liner.

A video inspection report shall be written or reviewed by an engineer or certified inspector, either of which must be qualified in visual inspection of tanks, coatings, or liners. The report must flag above-mentioned issues for possible quantification using appropriate techniques. It is unnecessary to document the entire video inspection with video still captures. Only areas of concern need be captured and annotated. The report must also locate areas of concern based on north-south directional coordinates as well as approximate vertical position if on the pit wall.

<u>Integrity Assessment Task 6B – Periodic Inspection of Coatings</u>

Ecology Publication 95-420 Section 3.1 states, *"Coatings will also degrade over time and need to be regularly inspected for wear, cracks and other failures through which spilled or released liquid could migrate to the underlying concrete."*

The publication further states, "*The interior surface of a concrete vault or curbing must be coated with a material that is impervious to and chemically compatible with the waste being stored....*"

Once these pits are assessed, an impervious coating must be applied to the interior walls. The coating must be chemically compatible with the waste products that could potentially contact it during a spill or release. The coating is to be applied in accordance with

Ecology publication #95-420, which states in part, "*Surface preparation and application of a protective coating system should be performed by a qualified individual. This individual should use proper equipment and follow application procedures recommended by the coating system manufacturer. It is also desirable that he or she be certified by the manufacturer of the particular protective coating being applied.*"

The coatings for these concrete pits and vaults must be inspected at some periodicity after installation, to ensure they are not degraded, and are free of chips, holidays, blisters, and other indications of a failed coating. The coating inspection should be conducted by certified coating inspectors, and the coatings should be repaired, as necessary to maintain proper containment. The Assessment must recognize the importance of maintaining the integrity of the ancillary equipment and piping, and the associated containment systems, and Maintenance should repair coating defects (holidays) at the earliest operational opportunities. Each inspection report must recommend a schedule for future inspections based on current and past assessments.

A plan must be prepared and approved by the W-314 IQRPE for a re-inspection program and periodicity for the refurbished pits.

4.2.2.2. Underground Transfer Piping

Integrity Assessment Task 7A – Assess Active Underground Transfer Piping

The current CH2M Hill plan (CHG 2003) calls for uncovering 5 diameters of buried transfer piping for integrity assessment. It is intended that the assessment of the five diameters is to allow certification of the entire line. Assessing five diameters of some transfer lines could amount to less than a statistically representative sample (see discussion under Integrity Assessment Task 5B).

A policy or procedure needs to be in place such that whenever the ancillary equipment, which has been covered, is exposed, the welds associated with the secondary piping should be inspected by ultrasound or equivalent technology to verify the integrity of the welds. The piping and ancillary equipment should be checked for evidence of damage to any coatings or tape wraps. If there are gouges, pits, cracks, wall thinning, or similar indications, the remaining wall thickness must be measured.

This policy should be considered an interim measure until a method of assessing larger lengths of pipe can be implemented. Certain technologies exist in the commercial industry that allows preliminary assessment of buried piping without excavation. Studies should commence to determine the feasibility of deploying such technologies at Hanford.

Integrity Assessment Task 7B – Inspection of Underground Transfer Piping

. The integrity project must establish an activity to obtain samples of at least one decommissioned transfer line. Sections of the piping must be examined to evaluate any degradation or corrosion of the base materials of the piping. Portions of the piping would also be set aside for the preparation of metal coupons, which can be used in any subsequent studies. Data from evaluating this decommissioned line may provide considerable insight into the expected condition of similar lines. This examination can also be used to provide CH2M HILL with information on the surface roughness on the pipe interior, which is required to accurately assess the capacities of the pumps required to support waste feed delivery to the immobilization plant for processing.

Specifically, samples should be obtained from the decommissioned line as follows.

- A full 3-6 inch section of transfer pipe assembly should be cut every 10 feet and sent to the appropriate laboratory for analysis (this sampling frequency may be adjusted for long runs of piping).
- An attempt should be made to include bend and joint portions of these lines for evaluation.
- Each section must be carefully catalogued by location, line number, and sample number.
- Sections containing cathodic protection attachment points should also be included in the samples when possible.

Additionally, at least one primary transfer line per tank farm must undergo an internal video inspection to the maximum possible distance for which the equipment is capable. However, for each decommissioned line that undergoes destructive testing, one video inspection may be eliminated. Table 4-1 provides a listing of candidate lines for video inspection. Both a primary and alternate selection is provided for flexibility. These lines were selected based on their relatively high frequency of use compared to the remaining lines in their respective tank farm.

Table 4-1 ***Candidate Primary Transfer Lines for Video Inspection***

Farm	Line	Alternate
AY	SN-633	SN-635
AZ	SN-632	SN-631
AN	SN-261	SN-266
AW	SN-270	SN-272
SY	SN-285	None
AP	SN-615	SN-618

Integrity Assessment Task 7C – Assess Drain Lines

Each pit contains a floor drain that is routed via buried pipe to either another pit or a tank. Many of the drains are simply embedded in the concrete structure of the pit floor and are routed directly to the tank with no soil contact. Drain lines undergo low duty service, primarily consisting of precipitation or wash down water at atmospheric pressure. A leak test of these lines is not practical and the nature of their service does not warrant a direct inspection. These lines will be assessed by review of their respective design and service dates.

4.2.3. Inspection Techniques and QA/QC

The Washington Department of Ecology names numerous types of inspection techniques in Publication 94-114 *Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste.* These inspection techniques listed in this governmental publication include

- visual (including video imaging),
- ultrasonics,
- radiography,
- liquid penetrant, and
- magnetic particle inspections.

Note that other inspection techniques (e.g., eddy current, Reynolds number determination, etc.) may be more appropriate to use as part of the system integrity evaluations. These would be determined, based on site-specific considerations, and recommendations from Inspection personnel.

For each inspection, the records must include the date, locations, results from the inspections, and records to document specific standards, which were used to confirm that the equipment was working properly, i.e., it had been properly calibrated. (Example:

Including the identification number for the controlled block of metal, that is used to calibrate ultrasonic thickness measurements).

Integrity Assessment Task 8A – Assess and Resolve Effects of Couplant Fluids

There are concerns associated with the ultrasonic inspections of DSTs, using crawlers located within the annulus space between the inner and outer wall. Specifically, water is being used as the couplant for transmitting the ultrasonic transducer vibrations to the base metal (and back), and there does not appear to be any provisions for removal of that water, following each inspection. Presumably, the water is expected to evaporate. However, a portion of that water vapor may condense and remain within the annulus spacing or seep under the DST primary bottom plate and into the insulating concrete. It does not appear that the water is being treated with chemicals to raise the pH, or that corrosion inhibitors are being added to that water. A formal analysis or evaluation must be performed or identified to ensure that the water is effectively and rapidly removed from the annulus by the ventilation system. In the interim, and in the event that the analysis is unsuccessful, the use of corrosion-inhibited water must be implemented as soon as possible. As an option, corrosion-inhibited water may be used indefinitely instead of any analysis.

4.2.4. Documentation/Certification of Individuals

Integrity Assessment Task 9A – Qualification of Individuals

The American Society for Nondestructive Testing (ASNT) offers certifications associated with several of the inspection techniques listed above. The American Petroleum Institute offers certifications for Tank/vessel inspections. NACE International, formerly the National Association of Corrosion Engineers, offers certifications for cathodic protection and coatings (along with other certifications). Individuals, who collect or generate the original data used in the integrity assessments, must hold the appropriate certifications.

The Certifications of individuals supporting inspections of DSTs, piping, and ancillary integrity assessments must be documented and included within the integrity assessment reports. In particular, the records would identify the Certifying Organization, the level of certification, and the date when such certification was obtained. When there is a date of expiration (or date for recertification), that date must also be specified in the records.

As of the issue date of this document, all personnel have been approved as qualified by the IQRPE. New or replacement individuals will require qualifications to be approved by the IQRPE as they join the team.

4.3. Analysis

Analysis performed will be a result of other activities identified throughout this plan and summarized in Table 2-1.

5. WASTE COMPATIBILITY

5.1. Dangerous/Hazardous Characteristics

In accordance with M-48-14 and 40 CFR 265.191(b)(2), WAC 173-303-640(2)(c), and WAC 173-303-640(3)(a), the DSTAR will need to consider the hazardous characteristics of the waste that have been, or will be handled. A waste compatibility assessment report will be prepared to review the materials of construction used for the DSTs and their ancillary equipment, typical waste characteristics, and corrosion mechanisms leading to an overall assessment with conclusions/recommendations. The waste characterization portion will address the historical differences.

5.1.1. Past

The effect of dangerous/hazardous waste products on the DST Systems can be considered to act directly or indirectly. Direct effects are those that are caused by direct contact of system components/materials with the waste product. Indirect effects include possible over-pressurization or weakening of the structure by fire or explosion due to the presence of flammable or explosive materials.

Historical wastes, which have contacted the DST Systems, are relevant to the DSTAR, since these wastes may have accelerated corrosion or degradation of the DST System materials beyond allowances provided in the original designs. While identification of these historical events may not provide an exact assessment of their effects on the DST System materials, they may provide insight into additional or specialized assessments that may be required to accurately certify those systems.

Integrity Assessment Task 10A – Review of Historical Excursions

This task will review work performed by General Electric on the single shell tanks with the intent of extrapolating results to the DST Systems. The review will also include work performed by General Electric on the single shell tanks with the intent of extrapolating results to the DST Systems. The DST work of Divine (PNL 1985) and more recent work by Danielson, Pitman, Elmore, etc., will also be used. Relevant Savannah River studies by Zapp or Mickalonis done for the Hanford wastes should be included.

The review will attempt to document excursions, if any, when the DST Systems were outside of operating parameters. This would include times of elevated temperature, unexpected contents, humidity changes both inside the primary tank and in the annulus, humidity changes both inside the primary tank and in the annulus, excessive fluid levels, empty/fill cycles, low/high pH, composition, etc. These data can come from existing Hanford databases for example, PCSACS, TWINs and others. Records and Occurrence

Reports discussing rare occurrences such as the reported addition of 5,000 gallons of dilute nitric acid should be reviewed and evaluated.

Consideration should be given to interviewing retired staff about operating anomalies that might never have been formally reported.

5.1.2. Present

Integrity Assessment Task 10B – Assess the Effect of Contacted Wastes on DST System Materials

As an extension of the activity identified in Section 5.1.1, current practices, that bring dangerous/hazardous wastes into contact with the DST System materials, must be reviewed and evaluated.

Not only will current waste contact with the DST System materials be evaluated but an evaluation of the status and applicability of ongoing laboratory testing and current corrosion probe programs both at Hanford and Savannah River will be made. "Present" programs include all programs currently in progress as well as any new programs that can provide data and/or will be completed by mid 2004.

It is anticipated only work dealing with direct effects will be examined. Indirect effects will have been reviewed in Task 10A, excepting any new chemicals or processes that are planned to be added.

5.1.3. Future

Integrity Assessment Task 10C – Evaluate and Document Worst Case Future Waste Transport and Storage Projections

It is necessary to review future transfer plans in an effort to determine the corrosive, and possibly erosive, nature of waste products planned for transfer or storage in the DST Systems. This understanding will provide confidence in the IQRPE certification of the systems.

6. ONGOING OPERATIONS

Inspections and evaluations of DST Systems will have been comprehensively performed by the time the DSTAR is issued. However, certification of the DST Systems by the IQRPE will be based on assumptions regarding the future use, controls, and inspection of those systems. The intent of this section is to establish tasks for the development of specific programs that ensure that the DST Systems are maintained, controlled and inspected such that the certification of the IQRPE is not rendered invalid and without meaning.

6.1. Corrosion Protection Measures

Integrity Assessment Task 11A – Assess The Condition of Existing Cathodic Protection Systems

The purpose of cathodic protection systems is to reduce or eliminate the potential for external corrosion to buried piping or components.

For underground transfer lines, the need for and/or condition of existing cathodic protection systems must also be assessed. The need for corrosion protection measures for buried transfer lines is based on the following factors in the environment surrounding the system:

- Properties in the soil surrounding the tank system including moisture content, pH, resistivity, structure-to-soil potential, sulfide and chloride content.
- Presence of stray electric currents from nearby electrical equipment using an external power source.
- The presence of nearby underground metal structures.
- Any corrosion allowance provided in the original design relative to actual corrosion rates and required design life.

All cathodic protection systems must be comprehensively assessed, evaluated and possibly upgraded or retrofitted. Periodic inspection programs for these systems must be established based on recommendations from individuals qualified in corrosion monitoring and protection systems.

6.1.1. Monitoring

WAC 173-303-640 is a broad regulation, whose purpose is to require maintenance of the integrity of new and existing tank systems, as well as the detection and containment of any spills or leaks. The document focuses attention on factors associated with external corrosion, cathodic protection systems, the use of corrosion resistant materials, and inspection.

WAC 173-303-810 (11), "Monitoring and Monitoring Records" further expands upon the General Permit Conditions, and includes a section on corrosion monitoring and monitoring records. The focus is data collection to document the sampling or measurement results, the dates and times of collection, and the specific locations, where the data was obtained. However, WAC 173-303-810 (11) does not include specifics regarding monitoring techniques, which are or are not acceptable. Monitoring techniques will be based on best available applicable technology and the engineer's review of the system.

Monitoring, as addressed within document WAC 173-303-640 (6)(b)(ii) is primarily based on reviewing results from leak detection instrumentation and releases (7)(d)(iii)(c). The Washington State Department of Ecology Publication 94-114 (June 1994) *Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste* has a broader interpretation of monitoring, and includes a discussion of the use of corrosion coupons within section 3.6 *Corrosion Assessment*, under a subsection entitled *Corrosion Protection Measures*. Compliance with WAC 173-303-640 and Publication 94-114 will require a detailed understanding of their application to the Hanford DST System.

Integrity Assessment Task 12A – Assess the Current Corrosion Monitoring Program

If inspection techniques are used to measure corrosion rates, significant (measurable) corrosion has to occur to the base materials, before it can be detected. That loss of base material (metal) cannot be replaced, and will have an effect upon all subsequent MAOP (maximum allowable operating pressure), structural integrity, and remaining lifetime calculations. Consequently, it may be desirable to be able to detect corrosion before measurable corrosion has occurred, and thus it may be necessary to use corrosion coupons and/or electronic probes, depending on projected corrosion rates and the frequency of "after-the-fact" inspections, such as UT.

Figure 4 below is from a paper entitled "On-Line Monitoring Techniques" by J.B. Mathieu, which was presented in Proceedings of the NACE Middle East Conference in Bahrain in 1994. It shows the relative response time for being able to detect corrosion, which is occurring at 10 mils per year (mpy).

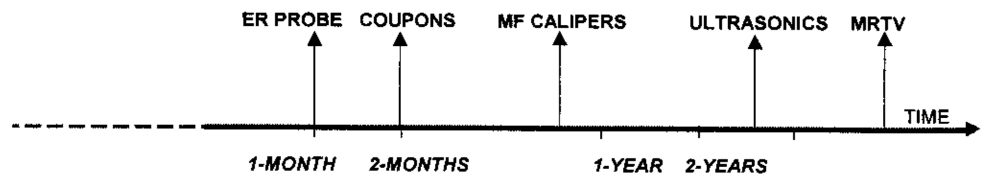


Figure 4 – "On-Line Monitoring Techniques"

Note for this figure that MVRT (MRTV in the figure) is MicroVertilog, which is a magnetic flux leakage technique. The MF is a multifinger caliper, which can make mechanical measurements inside piping. Of particular note is the relatively short response time required for coupons or the electrical resistance (ER) probes to be able to detect 10 mils of corrosion. Thus, corrosion monitoring offers the potential to be able to detect corrosion significantly quicker than inspection techniques, and this will allow remedial (chemical inhibition) treatments to be implemented quickly. The net result is that the integrity of equipment, such as DSTs can be maintained for an extended period of time, but a cost-benefit analysis for implementation of any "real time" corrosion monitoring would need to be accomplished.

Subsequent to the paper, new monitoring techniques have been developed. These include the high-resolution electrical resistance probes, which have improved electronics, and better signal to noise ratios, and electrochemical noise (EN) techniques, which are more sensitive, but more difficult to interpret. These would have quicker response times than the earlier generation electrical resistance probes or the use of coupons.

There are strengths and weaknesses associated with any type of corrosion monitoring technique, especially in the extreme caustic and radioactive waste environment of the DSTs. Consequently, it is anticipated that corrosion monitoring systems, which are recommended for the DSTs, would employ a combination of techniques, including the use of corrosion coupons, high resolution electrical resistance probes, and electrochemical noise or may also include in situ pH and corrosion potential probes . Such monitoring systems should also be used to measure the effectiveness of chemical treatments in modifying the local environments, such that passive conditions could be maintained throughout the DSTs. The monitoring results would also be checked to verify consistency with results from inspection techniques, such as ultrasonic measurements and videography.

An assessment of the current corrosion monitoring program must be performed to address many points associated with the present operations and inspection programs associated with the DSTs, with the goal of being able to detect the onset of corrosion, such that the appropriate corrosion mitigation programs can be implemented, and the lifetimes of the DSTs can be extended, if necessary. In particular, the assessment must include the following.

- The review of other widely used monitoring techniques such as high-resolution electrical resistance and linear polarization resistance for use in the DSTs.
- The relative homogeneity of the fluids and solids within individual tanks, and whether there may be localized corrosion cells. This may require the collection and analysis of samples taken from several locations within the tanks.
- Whether differences in waste composition across an individual tank could "drive" localized corrosion.
- The effectiveness of chemical additions. Some analyses have been performed to address migration times of caustic through the fluids and solids to the bottoms of DSTs. These analyses must be evaluated, validated, and enhanced, if necessary.
- The effectiveness of the current UT and video examination programs.
- The current prognosis with regard to the EN probe monitoring program, its reliability, and ease for proper interpretation.
- The review of existing coupon or electrochemical noise databases, and how such data is used for monitor corrosion and instituting chemical treatments.

The assessment should provide recommendations that, if implemented, will result in a more effective corrosion monitoring program.

6.1.2. Periodic Inspection

Integrity Assessment Task 12B – Develop Ongoing Inspection Program

A program for ongoing inspections beyond the release of the DSTAR must be developed for recommendation. The program should consider the findings of inspections, examinations, and evaluations performed in the development of the DSTAR. Specific inspection tasks must be in accordance with the intent of Ecology Publication 94-114 and consistent with inspection activities performed in the development of the DSTAR. It is expected that inspection activities will include but not be limited to:

- Video Examinations of DSTs, Concrete Pits, and Vaults,
- Periodic UT Examinations of DSTs,
- Opportunistic Examinations of Transfer Piping and other Ancillary Equipment
- Periodic Leak Testing of Catch Tanks,
- Periodic Leak Testing of Transfer Piping,
- Periodic Inspection and Testing of Cathodic Protection Systems.

6.2. Administrative Controls

6.2.1. Corrosion

WAC 173-303-640 (3) (h) addresses the need for proper documentation to record the design and installation of new tank systems or components. WAC 173-303-640 (6) (d) states the requirements that the owner/operators of tanks must document the operating records and inspection results, along with repairs and remedial activities, which are undertaken. WAC 173-303-810 (11) states that sampling and monitoring results must be retained. Further Washington Department of Ecology in Publication 94-114 emphasizes the need for documentation in several sections. For example, section 2.7 discusses certifications of repairs, while section 4.4 addresses the documentation of inspection results.

Integrity Assessment Task 13A – Assess the Existing Corrosion Control Program

Administrative controls must be in place to ensure corrosion monitoring, inspection, chemical treatment, and maintenance activity records are being archived, such that they can be easily accessed. This will enable integrity assessments to be completed more expeditiously, and ensure relevant details, which may have an impact upon integrity assessments, will be considered. The following are a number of questions related to data collection and data management practices, which should be reviewed as a portion of the evaluation of the present administrative controls.

- Are the records archived electronically, via hard (paper) copy, or both? If the records are archived electronically, are the records on a server, or only on individual computers?
- Are the records available as "Read Only" for most personnel to ensure integrity of the records is maintained? Are they backed up? How frequently?
- Are new records for sampling, monitoring, inspection, treatments, and maintenance posted promptly, or are there significant delays? Are the records sent to a central point of contact at a Computer Information Center?
- When data is uploaded to the central database, is there an automatic check for the values being submitted
    - To ensure the validity of the numbers,
    - To trigger maintenance or treatment activities, when values are outside acceptable limits,
    - To notify key individuals for reviewing the results/reports,
    - To mandate a "feedback" record to the system, regarding the acceptability of results,

- To ensure that required maintenance work is actually completed (generating periodic reports until the work is completed).
- Can the results be exported and used in conjunction with other operational data?

Fundamentally, it must be determined whether the current administrative controls regarding corrosion monitoring, inspections, chemical controls and treatments, and integrity assessments, are adequate. Consequently, the administrative controls for each of the programs needs be reviewed to ensure they are (a) practical, and (b) sufficient to help maintain the integrity of each DST and the associated ancillary equipment and piping.

Consider, for example HNF-IP-1266, *Tank Farm Administrative Controls*, Section 5.16 , "Corrosion Mitigation Program," which addresses the Chemistry Control Program. The program appears to have a good record keeping system and a good "feedback" system, regarding notifications to key individuals (positions) if sample analyses yield results, which are out of specification, such that Occurrence Reports and Recovery Plans would be processed. The sampling frequency is based on the most current analysis of the composition of the waste, and the projected trends of chemical depletions. However, the analysis results may be "out of date," particularly if new fluids and solids are being added to the tanks and changing the chemical mixture (as documented in the required compatibility studies). Further, the contents of the DST's cannot be assumed to be homogeneous. Therefore, an understanding of the statistical meaning of a limited number of samples is needed (see IA Task 5B). Perhaps the chemistry control programs should include additional results from on-line corrosion monitoring instrumentation or other instrumentation to measure the fluid's pH. The Recovery Plans also need to require the generation of a report to document that the contents within the tanks are now back within specifications.

6.2.2. Loading

Integrity Assessment Task 14A – Assess Dome Deflection Survey Program

Publication 94-114 (Section 2.1) cites examination for evidence of excessive or uneven settlement of the tank foundation as a necessary integrity assessment activity. An activity for developing a methodology for monitoring tank settlement should be implemented. One such means is to perform dome deflection surveys on double-shell tanks as is presently accomplished for single-shell tanks. While focusing primarily on monitoring for static deflection of the tank dome, such surveys are the only established means of monitoring tank settlement. Although not strictly applicable to these buried tanks, API Code 653 and API Code 650, which address the construction of above ground storage tanks, should be reviewed for guidelines and criterion, which relates to bulges or distortions that are indicative of uneven settlement of tanks.

Integrity Assessment Task 14B – Assess DST System Loading Control Program

Administrative controls currently exist for dome loading of DSTs. The results obtained from tank modeling activities, identified in Section 3.4 should be used in controlling live and dead loads introduced on each DST System. The DST System includes DSTs, catch tanks, DCRTs, pits and transfer lines. Loading of each of these subsystems must be controlled, where loads are applied. The DST System loading administrative control program should be expanded to include transfer lines.

Excessive loading on these structures could result in a serious breach of containment. The loading controls on transfer lines, however, require further discussion. Most transfer lines are located in low traffic (low load) zones within the tank farms. However, some lines cross roads outside of the tank farms, or high vehicle traffic areas in and out of the tank farms. Each of these lines needs to be identified, classified and analyzed (if previous analysis is inadequate or cannot be located) for potential loads. Most likely, these lines have already been adequately analyzed. A record of these analyses is needed to ensure their adequacy and completeness. Maximum allowable vehicle loads must be established or identified for each transfer line located in a vehicle traffic zone of influence.

7. SCHEDULE

A schedule for execution of the DSTAR Plan is provided in Table 2-1. The schedule assumes adequate funding, priority, and resources are provided. The schedule is based on the tasks identified in Table 2-1.

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Appendix A

**RPP-7574 Rev. 1 Compliance Matrix
Against
WAC 173-303-640(2)**

Table A-1 - WAC 173-303-640(2) Compliance and Implementation Matrix

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
1	The tank system is adequately designed [(2)(c)]	• The design adequacy relative to the abnormal or accident conditions will be assessed by design calculations or use of experience data, or the consequence of failure will be precluded by administrative controls [Section 4.5.1 pp 4-13]. • The detail and completeness of the design calculations and the quality control, testing, and inspection during construction will be assessed [Section 4.5.1 pp 4-14].	Establish an explicit statement, which defines adequacy of design for the DST System (DST System includes ancillary equipment). The PNNL Thermal and Seismic Analysis project activities do not appear to be explicitly addressed in RPP-7574, Rev. 1. It should be pointed out that the new analysis will consider dead weight loads, hydrostatic pressure, soil loads, equipment loads, thermal loads including thermal ratcheting and live loads.
2	The tank system has sufficient structural strength (in light of applicable waste types and quantities) [(2)(c)].	• Assess the structural integrity of all 28 DSTs, including refining the structural analysis of record; this assessment will include temperature effects on material properties and aging (specific to the AY and AZ tanks) [Section 2.3.1 b-3]. • Document secondary shell integrity actions and results [Table 1, 7.1] **COMPLETE**. • Develop secondary shell integrity requirements in program plan [Table 1, 7.2] **COMPLETE**. • The structural stability of the tank system design will be assessed by reviewing the national codes and standards used during design, construction, and inspection [Section 4.5.1 pp 4-13]. {Thought not included in RPP-7574, ongoing project: PNNL Thermal and Seismic Analysis Project will provide extensive stability analysis of the tanks}	Verify/establish design, maximum, and minimum operating temperatures for both primary and secondary tanks. Verify/establish life expectancy of secondary tank when exposed to waste. Expand scope to explicitly include ancillary equipment.
3	The tank system has compatibility with the waste [(2)(c)].	• Restore/maintain all DSTs within the requirements of TSR AC 5.15 (HNF-SD-WM-TSR-006) [Section 2.3.1 b-7]. • Adjust chemistry within specification for four DSTs [Table 1, 3.1] • Revise operating procedures to require corrective plan for out-of-specification conditions within 30 days of discovery [Table	While section 4.7.2 and 4.7.1 describe an action plan to restore waste chemistry in AN-107 to specification, there is some concern that the time required to provide adequate mixing is excessive (Ref. RPP-9504). Tests and analysis indicate that even though the sludge in AN-107 is slightly out

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
		1, 3.3] **COMPLETE**. • Implement TSRs on tank chemistry controls [Table 1, 3.4] **COMPLETE** • Tank system components will be assessed for compatibility to store, handle, transfer, and/or process the various waste solutions to be handled. A comparison will be made of the waste types with the material compatibility tables published by the NACE, the ASM, or other applicable sources of material degradation data. The waste chemicals and other monitored characteristics will be assessed to demonstrate the care and caution used to maintain tank integrity [Section 4.5.1 pp 4-14].	of specification, the corrosion effects to the tank material are inconsequential. Unfortunately, it is difficult to assume that the sludge is homogeneous. Adding caustic without adequate mixing is not good practice. Either further sampling is required to verify a homogeneous mixture, or a mixer pump should be installed in the tank. A formal correlation needs to be made between compatibility of waste with tank and waste with ancillary equipment. Pits should be explicitly addressed. Poly-urea should be formally considered to be a means of providing the needed coatings on pits as discussed in publication 95-420.
4	The tank system is not leaking or otherwise unfit for use (will not collapse, rupture or fail) [(2)(a)].	• Development and adaptation of Electrochemical Noise (EN) monitoring is under way at the Hanford Site to provide better understanding of corrosion mechanisms in DSTs and to support more effective control of tank waste chemistry to minimize corrosion [Section 4.3.4.1 pp 4-4]. • Corrosion potential testing is to be performed per ASTM G5-94 [Section 4.3.4.2 pp 4-6]. • Periodic visual and ultrasonic (UT) examinations of DSTs is planned for and scheduled [Section 4.4.1.1 pp 4-7]. • Periodic visual and ultrasonic (UT) examinations of CTs and DCRTs is planned for and scheduled [Section 4.4.1.2 pp 4-8]. Static leak tests are planned and scheduled for CTs AZ-151 and A-350 [Section 4.4.2.2 pp 4-9]. • Document secondary shell integrity actions and results [Table 1, 7.1] **COMPLETE**. • Develop secondary shell integrity requirements in program plan [Table 1, 7.2] **COMPLETE**. • Where appropriate, analyses will be performed to	The EN monitoring program has been ongoing for sometime and is apparently still under development. This program should be accelerated such that a decision to implement can be made prior to FY06. Also, an updated industry search should be made for new monitoring technologies that may be more straightforward than EN. The program takes credit for level gauges and annulus leak detectors. However, these devices do not address any porosity that may have occurred in the vapor space region of the tank. The first indication of a problem in that area will be a leak. Reviewed documentation indicates that the secondary tank was not leak tested. Only the first 27 feet of welds were radiographed, while the operating limit of the primary tank is above that (422"). Evaluations will be required to determine

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
		demonstrate, by a combination of material behavior analyses and historical data, that tank system components either have not experienced general corrosion or stress corrosion cracking damage from the wastes or have experienced damage at a slow rate. Information obtained during the integrity assessment inspections and testing will be incorporated into this determination. An assessment will be performed that will permit conclusions to be made about current conditions and life expectancy of the tank systems [Section 4.5.1 pp 4-14]. • Special attention will be paid to the adequacy of the concrete shell foundation designs for tanks, as well as to the integrity of tank walls to sustain internal hydrostatic and/or external loading conditions [Section 4.5.1 pp 4-14].	(422"). Evaluations will be required to determine the adequacy of secondary containment to perform as designed.
5	Design standards used in the tank system's construction [(2)(c)(i)].	• Activities are planned and scheduled which result in development of integrity assessment reports. The integrity assessment report activity is intended to include the specific assessment subject matter identified in section 4.5.1. • Document secondary shell integrity actions and results [Table 1, 7.1] **COMPLETE**. • Develop secondary shell integrity requirements in program plan [Table 1, 7.2] **COMPLETE**. • The assessment of design standards will be based on the premise that the design for standard operating conditions will be proven to be adequate by review of historical data, by the inspections planned, and by the evaluation of time-dependent failure mechanisms [Section 4.5.1 pp 4-13]. • The assessment will identify design standards, codes or regulations used to design, construct, maintain, and operate the tank system. Compliance with the requirements of the latest revision will be evaluated as applicable [Section 4.5.1	

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
		pp 4-14].	
6	Dangerous characteristics of the waste that **have or will be** handled [(2)(c)(ii)].	• Restore/maintain all DSTs within the requirements of TSR AC 5.15 (HNF-SD-WM-TSR-006) [Section 2.3.1 b-7]. • Review and revise storage volume projects as retrieval and process schedules are improved and tank corrosion monitoring information is updated [Table 1, 2.1] • Decide whether additional actions are needed to ensure safe storage long term [Table 1, 2.2] • Document secondary shell integrity actions and results [Table 1, 7.1] **COMPLETE**. • Develop secondary shell integrity requirements in program plan [Table 1, 7.2] **COMPLETE**.	An evaluation of projected waste compatibilities must be performed.
7	Existing corrosion protection measures [(2)(c)(iii)].	• Assess the viability of employing corrosion probes in DSTs to support tank corrosion prevention [Section 2.3.1 b-6]. • Perform and document engineering evaluation of annulus ventilation effect on corrosion [Table 1, 1.b.1] **COMPLETE**. • Establish chemistry monitoring requirements for corrosion control [Table 1, 3.2] **COMPLETE**. • Maintain annulus ventilation systems and restore to operations [Table 1, 4.1] **COMPLETE**. • Corrosion probe program **underway** [4.3.4.1] • Activities in Table 2, **pending funding**. • Corrosion potential test, per ASTM G5-94 to be performed on select tanks • The presence of cathodic protection for underground waste transfer piping will be considered. Any internal or external corrosion protection measures incorporated into the design, construction, and operation phases will be identified. The effectiveness of any in-place corrosion protection will be evaluated and appropriate recommendations will be provided [Section 4.5.1 pp 4-14]. • Raw water headers will be isolated from the tank farms except when in use. The project will reassess need for additional leak testing and inspection of raw water systems based on	The corrosion probe program requires review for adequacy.

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
		results of annulus video examinations [4.4.2.4]	
8	Documented age of the tank system or an estimate (if documentation unavailable) [(2)(c)(iv)].	• Predict remaining DST useful life [2.3.1 b-8] • Review and revise storage volume projects as retrieval and process schedules are improved and tank corrosion monitoring information is updated [Table 1, 2.1] • Identify aging mechanisms [Section 4.3.1, 4.3.2 & 4.3.3] **COMPLETE**	A number of documents exist which identify the original construction dates of each tank farm. Some appear to conflict or are incomplete. The correct age of the tanks needs to be brought forward. A comprehensive documented analysis of the age of transfer lines and ancillary equipment is not available and needs to be developed.
9	For ancillary equipment, this assessment must include either a leak test, as described above or other integrity examinations that address the presence of cracks, leaks, corrosion and erosion [(2)(c)(v)(B)].	• Assess the structural integrity of CTs and DCRTs, including refining the structural analysis record [Section 2.3.1 b-4] • An assessment will be performed that will permit conclusions to be made about current conditions and life expectancy of the tank systems [Section 4.5.1 pp 4-14]. • Assess the fitness for use of the DST System transfer secondary piping [Section 2.3.1 b-5] • During FY2004, an overall test plan will be developed for evaluation of the DST System RCRA-compliant transfer piping planned for use after FY2005. Only the secondary piping of the double-contained piping will be tested [4.4.2.3]	• Methods for transfer system assessment not developed. • Primary piping integrity should be assessed.
10	If assessments conducted find a tank system to be leaking or unfit for use, comply with the requirements of WAC 173-303-640(7).	Emergency pumping plans are in place per HNF-3484.	
11	Develop a schedule for conducting integrity assessments over the life of the tank to ensure that the tank retains its structural	Schedule recurring ultrasonic tests to enable corrosion rate and useful life projections [Table 1, 6.1] **COMPLETE** for AN-105 only.	

Item	WAC 173-303-640(2) Element Description	CHG Plan for Compliance per RPP-7574 Rev. 1	Deficiencies, if Any
	integrity and will not collapse, rupture, or fail. The schedule must be based on the results of past integrity assessments, age of the tank system, materials of construction, characteristics of the waste, and any other relevant factors [(2)(e)].		

Appendix B

**DSTIP Program Compliance Matrix
Against
BNL-52527**

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Tank Selection	At least 10% (or 1 if < 10%); select based on age, severity of operating conditions, and transients; if not homogenous, >10% may be required to represent worst-case	• Tank selection based on weighted averages of waste composition, least waste height variation, temperature, age, and material. All 28 DSTs prioritized based on these criteria. • All 28 DSTs will have initial inspection (UT baseline) by the end of FY 2005. UT inspections will be repeated in successive 8-10 year cycles. • 6 DSTs selected for examination of tank bottoms and 6 DSTs selected for examination of lower knuckles were selected based on a variety of factors as documented in "Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks – FY 2001" (RPP-6839)	• N/A—exceeds TSIP guidance • Examination of all 28 DSTs will be performed in accordance with M-48 milestone agreement with state of Washington • Number of DSTs selected for examination of tank bottoms and lower knuckles were agreed upon by the Washington State Department of Ecology.	Rational for UT of all 28 DSTs versus 3 required by DSTIP is that the DSTs have different service dates and different types of waste. Reference: "Description of Double-Shell Tank Selection Criteria for Inspection" (WHC-SD-WM-ER-529).
	If >10% are examined, option to reduce percent per tank accordingly.	No reduction used	Required scope by M-48 milestone agreement with state of Washington	None

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Extent of Examination	5% of liquid-vapor interface	The liquid/vapor interface on 6 DSTs will be examined over a 20 ft. length, 15 in. wide centered on the estimated location of the static liquid/air interface that existed for a minimum of 5 years. This area will be examined for pits, cracks, and wall thinning.	This scope of examination is as agreed to by DOE and Ecology in draft TPA milestone M-48-14. A 20 ft. length in a 75 ft. diameter tank exceeds 5% of the liquid/air interface. 15 inches centered on the liquid air interface does not comply with the TSIP guidance of +/- 1 foot, but can be accomplished in a single scan—otherwise 2 scans would be required to encompass 12" above and 12" below the interface. However this scope can be and has been increased depending on the condition of the tank. For example, on AY-101 two scans were done on the liquid/air interface because thinning was found over a fairly large vertical range in the two 15-in. wide vertical scans on the east side of the tank. In all 28 DSTs, any previous or existing liquid/air interface is examined in the top-to-bottom 30-in. wide vertical strip (consisting of two 15-in. wide vertical strips) that is scanned in each tank.	Should there be more than one interface of 5 or more years, an evaluation will be performed to determine if it needs examination as well.
	5% of liquid-sludge interface	Any liquid/sludge interface above the lower knuckle weld is examined over a 30-in. length, within the 30-in. vertical strip examined on each DST. No horizontal scan of the liquid/sludge interface is conducted.	UT results to date for vertical scans in 11 DSTs have not found any evidence of accelerated degradation or flaws at a liquid/sludge interface that exists now, or may have existed during the tank operating history. By FY 2005, all 28 DSTs will be examined over a ~35-ft. by 30-in. wide vertical strip. Evidence of accelerated degradation or flaws at a liquid/sludge interface could potentially cause expansion of the examination scope for that tank.	None

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Extent of Examination (cont.)	5% divided between knuckle* base metal and lower weld if accessible. Otherwise 5% of knuckle divided into two or more segments. *Lower knuckle of primary tank. Predicted maximum stress region of base metal plus lower weld if accessible.	• 6 DSTs have been identified for examination of a 20-ft. circumferential length of the lower knuckle. Examinations are to be conducted on the entire 20-ft. length in each interval, rather than partially in sub-intervals. • SAFT/TSAFT will inspect the lower knuckle region to the lower knuckle/bottom plate weld. • Extended arm P-scan will overlap the SAFT/T-SAFT inspection from the lower knuckle top weld to just above the maximum stress region. • The bottom/lower knuckle weld is not examined, except through air slots when tank bottoms are examined. • 20 ft of weld and HAZ joining the vertical wall to lower knuckle is examined, if accessible.[1] The entire 20-ft. length is examined at one time—not in 2 or more subintervals.	• N/A exceeds TSIP guidelines for lower knuckle region. Examination scope is not presently planned to be apportioned among sub-intervals due to higher costs associated with multiple tank entries. Examination of lower knuckle region is dependent upon accessibility. • Frequency of successive lower knuckle region examinations will be increased if significant degradation or evidence of SCC, or any cracking is observed. • No cracks, significant wall thinning, or other problems have been observed to date in examination of the welds and HAZ in 11 DSTs.	Development of a tandem synthetic aperture focusing technique (TSAFT) was accomplished and deployed on one DST (January 2003), demonstrating the ability to examine the high stress region and lower knuckle to bottom weld. An extended arm for UT examination allows more area of the knuckle to be examined above the high stress region.

[1] Exceptions: On AY-101 and AY-102, lower knuckle weld could not be examined due to concrete splatter. Instead, 20 ft of the lowest accessible horizontal weld is examined—which in AY-102 was the weld joining plate #2 to plate #3. On AW-103 (the first tank examined—in 1997) welds were not examined, except where included in the 10¼ in. wide vertical strips.

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Extent of Examination (cont.)	Examine primary tank bottom as practical for cracks, pits, and wall thinning, on a "best effort" basis.	Primary tank bottoms are scheduled to be examined through accessible air-slots for wall thinning and circumferential cracks, on 6 DSTs. Per TPA Milestone M-48-14, the examination shall extend at least ten feet toward the center of the tank from the lower knuckle joint or to the length practical within the limits of best available equipment. Extent of examination is dependent on surface conditions, obstructions, and geometry constraints.	N/A—current approach complies with TSIP guidance for tank bottoms	None
	External surface of primary tank In accessible regions, UT 10 areas of 1 ft^2 area for thickness measurement.	Each of 28 DSTs is examined over a ~35-ft. by 30-in. wide vertical strip, regardless of waste surface level. Overall coverage of vertical wall exam is approximately 87 ft^2. Wall examinations also include 20-ft. of vertical welds, and 20-ft. of vertical wall/lower knuckle weld.	N/A—current approach complies with and exceeds TSIP guidance	None
	Secondary tank - 5 areas of 1 ft^2 and 5% of knuckle region welds	Examination of a 20-ft. length of the secondary tank knuckle and 10 square feet of the secondary tank floor, for wall thinning, pits, and cracks is planned for 3 DSTs.	N/A—current approach exceeds TSIP guidance	None

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Evaluation Criteria/ Acceptance Levels	• Wall thinning: 20% of nominal wall thickness (t) • Pits: 50% t • Cracks <12": 50% t • Cracks >12": 20% t	• Wall thinning: ≥20% t • Pits: ≥ 50% t • Cracks <12": 3/16" • Cracks >12": 3/16"	• N/A for wall thinning and pits (same as TSIP) • Hanford acceptance criteria for crack depth is equal to or more stringent than TSIP guidance for crack length <12 in., but less stringent for crack length >12 in. Hanford acceptance criteria for crack length >12 in. is consistent with WHC-SD-WM-AP-036, issued 9/27/95. Rationale: a single conservative value for crack depth acceptance criteria, independent of plate thickness, is less prone to error than one that varies with plate thickness (i.e. used 50% of 3/8" plate). In practice, all detectable cracks have been reported	ASME Section XI, IWC-2424 was used as references in developing Hanford Standards
	Additional Examinations are to follow IWC-2430: Examination results that exceed acceptance criteria require extending the examination to include additional areas of similar material and service	Where indications are found, additional examinations are performed, as directed by an expert panel (UT Inspection Panel).	N/A—practice at Hanford has involved: • increasing the sample size to all 28 DSTs vs. original scope of 6 DSTs, • extending examinations, in the same tank, when acceptance criteria was triggered or approximated, based on recommendations of the UT Inspection Panel consistent with WHC-SD-WM-AP-036.	ASME Section XI, IWC-2430 and IWA-2430 were used as references in developing Hanford Standards
	Repair or corrective action for > 75% t	Repair not currently an option. Management decision not to pursue development of specialized repair technology/equipment, based on projected DST life cycle/cost benefit (i.e., repair need unlikely before mission completion).	N/A	None

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Acceptance Criteria	None	Evaluation of indications exceeding the acceptance levels are documented, tracked, and dispositioned via the Hanford occurrence reporting system. Part of this disposition includes assembling a UT inspection review panel comprised of appropriate subject matter experts. Analysis of indications is performed in accordance with industry accepted methods, such as, but not limited to, ASME XI, API, EPRI, and NASA.	N/A – not covered by TSIP guidelines	None
Frequency	10 years	• Initial inspection occurred more than 10 years after DSTs placed in service. This is scheduled to be complete in FY2005 • Repeat inspections planned at an 8 to 10 year intervals	• UT program for DSTs established when draft TSIP guidelines became available, codified in TPA Milestone M series. • Intervals for repeat inspections are consistent with TSIP guidelines	ASME Section XI, IWA-2432 is used as a reference for development of frequency
Schedule	None	See Frequency	N/A	
Equipment	Capability of detection and sizing – must detect 50% of nominal wall thickness (t) pits, 20% t thinning, 20% t for 1 ft length and 50% t for shorter cracks; uncertainty no more than ± 20% of these values	• Wall thinning: +/- 0.02". • Pits: +/- 0.05" • Cracks: +/- 0.1"	Rationale: Accuracy limits for Hanford DSTs were established not as a function of plate thickness, but based on actual equipment capability as demonstrated in Performance Demonstration Tests administered by PNNL in 1998 and 2000. Accuracy limits for thinning and pitting in Hanford DSTs are equal to or more stringent than TSIP recommendations for ½" or heavier plate sizes, but less stringent for 3/8" plate size. Accuracy limits for crack depth in Hanford DSTs are less stringent than TSIP recommendations.	ASME Section XI Appendix VIII used for stress corrosion cracking

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Inspector Qualifications	ANSI/ANST CP-189	NDE personnel are qualified in accordance with ASNT Recommended Practice SNT-TC-1A-92	Both ASNT CP-189 and SNT-TC-1A-92 were considered in establishing qualification requirements for personnel. SNT-TC-1A was considered adequate for tank inspections, and was selected. At the time of selection most NDE technicians were being qualified to SNT-TC-1A. Additionally, Inter-granular Stress Corrosion Cracking (IGSCC) training is required for NDE Level III technicians.	None
UT Procedure Requirements	Applicable portions of ASME Section XI Appendix VIII should be limited to 2100 (a), (b), (c), and (d); and Supplements 2 and 3.	UT contractor procedure includes all elements in VIII-2100, does not include supplements 2 and 3 since they do not apply to tanks.	N/A—UT procedure for DSTs complies with TSIP guidance. Supplements 2 and 3 apply to piping—not to tanks.	None
Action Limits	See evaluation criteria.	See evaluation criteria.	See evaluation criteria	None
Records Management	None	36 CFR (Code of Federal Regulations), 1234 DOE O 1324.5B, DOE O 414.1, 10 CFR 820, DOE O 200.1	None	None
Tank Selection	At least 10% (or 1 if < 10%); select based on age, severity of operating conditions, and transients; if not homogenous, >10% may be required to represent worst-case	All DSTs, both primary interior and annulus examinations	Exceeds TSIP guidelines	None
	If >10% are examined, option to reduce percent per tank accordingly.		No reduction used	None

Table B-1. Hanford Double-Shell Tank Integrity Program Elements. (11 sheets)

UT	TSIP (BNL-52527 –UC-406)	Hanford DST Integrity Program	Rationale for Departure from TSIP Guidelines	Comments
Extent of Examination	External surface of primary tank if accessible, and internal surface of secondary tank if such exists. Overall scan of accessible regions;	Examination form 4 risers providing close to 360 degree coverage of primary tank external and secondary liner internal surfaces	Accessible areas examined	None
	Vapor region at top of primary tank.	The internal dome and wall above the liquid level	Accessible areas examined	None
	Overall scan of internal surface when tank is essentially empty.	Examination to be performed	Accessible areas examined	None
Evaluation Criteria	Any signs of degradation must be evaluated.	Signs of degradation or leakage or both must be evaluated. Compare results to previous inspections for signs of change.	Meets guidelines	None
Acceptance Criteria	Any signs of degradation must be evaluated.	Signs of degradation and/or leakage must be evaluated.	Meets guidelines	None
Frequency	At least once each inspection interval (10 years).	Examinations done routinely on a 5 to 7 year frequency and when UT examinations indicate conditions requiring visual examination	Exceeds guidelines	Visual baseline complete in FY 2003
Schedule	None	See frequency	See frequency	None
Equipment	None	S-VHS video cameras are used to visually examine areas	N/A	CH2M HILL quals for equip. & operators are used
Inspector Qualifications	ANSI/ANST CP-189	No certified visual examiners are used. Engineers with experience are used to determine degradation	ASME Code examinations are not performed. However, Inspection Team member qualifications have been reviewed and approved by the IQRPE (per LATA-JHH-03-014 letter of 2/7/03)	None
Action Limits	See evaluation criteria.	See evaluation criteria.	See evaluation criteria.	None
Records Management	None	36 CFR (Code of Federal Regulations), 1234 DOE O 1324.5B, DOE O 414.1, 10 CFR 820, DOE O 200.1	N/A	None

REFERENCES

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WHC-SD-WM-AP-036, 1995, *Acceptance Criteria for Non-Destructive Examination of Double-Shell Tanks,* Rev. 0, Westinghouse Hanford Company, Richland Washington.

ASME Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components,* 2001, (Sub-article IWC-2430, paragraph IWC-2424,and sub-article IWA-2430, paragraph IWA-2432), American Society of Mechanical Engineers, New York, NY.

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ASNT Recommended Practice SNT-TC-1A, 1992 edition, The American Society of Nondestructive Testing, Inc., Columbus, OH

ASNT Standard for Qualification of Nondestructive Testing Personnel CP-189, (ANSI/ANST CP-189-1995), The American Society of Nondestructive Testing, Inc., Columbus, OH

36 CFR 1234, *Electronic Records Management,* Code of Federal Regulations, as amended

10 CFR 820, *Procedural Rules for DOE Nuclear Activities,* Code of Federal Regulations, as amended

LATA-JHH-03-014, *IQRPE, Contract 17432, Evaluation of Additional DSTIP NDE Inspection Team Member Qualifications*, dated 2/7/2003, J. Huber to P. McDonald

DOE Order 1324.5B, 1995, *Records Management Program.*

DOE Order 414.1A, 2001, *Quality Assurance.*

DOE Order 200.1, 1996, *Information Management Program*

Appendix C

DST System Assessment Matrix

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AN-01A	Central Pump Pit	AN	H-2-71991	May-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-15831 Rev. 0	
241-AN-01B	Drain Pit	AN	H-2-71991	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-01D	Drain Pit	AN	H-2-71991	Sep-81	Deferred Use	N/A	N/A	N/A	
241-AN-02A	Central Pump Pit	AN	H-2-71992	Dec-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-18678 Rev. 0	Pit Refurbished
241-AN-02B	Drain Pit	AN	H-2-71992	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-03A	Central Pump Pit	AN	H-2-71993	Dec-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-18679 Rev. 0	Pit Refurbished
241-AN-03B	Drain Pit	AN	H-2-71993	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-04A	Central Pump Pit	AN	H-2-71994	May-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-15831 Rev. 0	W-314
241-AN-04B	Drain Pit	AN	H-2-71994	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-04D	Slurry Receiver Pit	AN	TBD	May-03	New Installation	6A, 6B, W-314	N/A	RPP-15831 Rev. 0	Fed by SLL-3160
241-AN-05A	Central Pump Pit	AN	H-2-71995	Sep-02	Inspection / Refurbishment	6A, 6B, W-314	N/A	RPP-12252 Rev. 0	Pit Refurbished
241-AN-05B	Drain Pit	AN	H-2-71995	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-06A	Central Pump Pit	AN	H-2-71996	Sep-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-12551 Rev. 0	Pit Refurbished
241-AN-06B	Drain Pit	AN	H-2-71996	Sep-81	Emergency Use	N/A	N/A	N/A	
241-AN-07A	Central Pump Pit	AN	H-2-72039	Dec-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-18680 Rev. 0	Pit Refurbished
241-AN-07B	Drain Pit	AN	H-2-72039	Sep-81	Emergency Use	N/A	N/A	N/A	

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AN-101	1,200,000 Gallon Waste Tank	AN	H-2-71991	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-10199 Rev. 0 (2002)		
241-AN-102	1,200,000 Gallon Waste Tank	AN	H-2-71992	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-11581 Rev. 0 (2002)		
241-AN-103	1,200,000 Gallon Waste Tank	AN	H-2-71993	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-RPT-24476 Rev. 0 (2005)		
241-AN-104	1,200,000 Gallon Waste Tank	AN	H-2-71994	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-AN-105	1,200,000 Gallon Waste Tank	AN	H-2-71995	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	HNF-4816 Rev. 0 (1999) RPP-13259 Rev. 0 (2003 sup)		
241-AN-106	1,200,000 Gallon Waste Tank	AN	H-2-71996	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-4817 Rev. 0 (1999)		
241-AN-107	1,200,000 Gallon Waste Tank	AN	H-2-72039	Sep-81	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-3353 Rev. 1 (1999)		
241-AN-A	Valve Pit	AN	H-2-71989	May-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-16375 Rev. 0 RPP-16376, Rev. 0	
241-AN-B	Valve Pit	AN	H-2-71989	May-03	Inspection / Refurbishment	6A, 6B, W-314		RPP-16375 Rev. 0 RPP-16376, Rev. 0	
COB-AN-7	Clean Out Box	AN	H-2-71992	Sep-81	N/A – Removed from service in 2004	N/A	N/A	N/A	E-525
COB-AN-8	Clean Out Box	AN	H-2-71995	Sep-81	N/A – Removed from service in 2004	N/A	N/A	N/A	E-525
COB-AN-9	Clean Out Box	AN	H-2-71986	Sep-81	N/A – Removed from service in 2004	N/A	N/A	N/A	E-525
DR-364	Drain Line	AN	H-2-71991	Sep-81	Analysis	7C			

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
DR-366	Drain Line	AN	H-2-71991	Sep-81	Analysis	7C			
DR-368	Drain Line	AN	H-2-71991	Sep-81	Analysis	7C			
DR-369	Drain Line	AN	H-2-71989	Sep-81	Analysis	7C			
PW-401	Diluent/Flush	AN	N/A	N/A	N/A	N/A	N/A	N/A	W-211
PW-402	Diluent/Flush	AN	N/A	N/A	N/A	N/A	N/A	N/A	W-211
PW-461*	Annulus Leak Detection Return	AN	H-2-71991	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-462*	Annulus Leak Detection Return	AN	H-2-71992	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-463	Annulus Leak Detection Return	AN	H-2-71993	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-464	Annulus Leak Detection Return	AN	H-2-71994	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-465	Annulus Leak Detection Return	AN	H-2-71995	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-466	Annulus Leak Detection Return	AN	H-2-71996	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-467	Annulus Leak Detection Return	AN	H-2-72039	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
PW-471	Annulus Pump Pit Return	AN	H-2-71991	Sep-81	Emergency Use	N/A	N/A	N/A	
PW-472	Annulus Pump Pit Return	AN	H-2-71992	Sep-81	Emergency Use	N/A	N/A	N/A	
PW-473	Annulus Pump Pit Return	AN	H-2-71993	Sep-81	Emergency Use	N/A	N/A	N/A	
PW-474	Annulus Pump Pit Return	AN	H-2-71994	Sep-81	Emergency Use	N/A	N/A	N/A	
PW-475	Annulus Pump Pit Return	AN	H-2-71995	Sep-81	Emergency Use	N/A	N/A	N/A	

Table C-1 – ***Matrix of Components to be Assessed (17 pages)***

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
PW-476	Annulus Pump Pit Return	AN	H-2-71996	Sep-81	Emergency Use	N/A	N/A	N/A	
PW-477	Annulus Pump Pit Return	AN	H-2-72039	Sep-81	Emergency Use	N/A	N/A	N/A	
SL-161	Slurry Transfer Line	AN	H-2-71991	Sep-81	Proposed Deferred Use	N/A	N/A	2E-04-1595 7-19-05	Enc. Tested at 68psig
SL-162	Slurry Transfer Line	AN	H-2-71992	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-163	Slurry Transfer Line	AN	H-2-71993	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-164	Slurry Transfer Line	AN	H-2-71996	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-165	Slurry Transfer Line	AN	H-2-71996	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-166	Slurry Transfer Line	AN	H-2-71996	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-167	Slurry Transfer Line	AN	H-2-72038	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SL-168	Slurry Transfer Line	AN	H-2-72038	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SN-261	Supernate Transfer Line	AN	H-2-71991	Sep-81	Inspection/Test/Analysis	4B, 11A		2E-04-1595 7-19-05	Enc. Tested at 67psig
SN-262	Supernate Transfer Line	AN	H-2-71992	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SN-263	Supernate Transfer Line	AN	H-2-71993	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SN-264	Supernate Transfer Line	AN	H-2-71994	Sep-81	Deferred Use	N/A	N/A	N/A	
SN-265	Supernate Transfer Line	AN	H-2-71995	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SN-266	Supernate Transfer Line	AN	H-2-71996	Sep-81	Inspection/Test/Analysis	4B, 11A			
SN-267	Supernate Transfer Line	AN	H-2-72038	Sep-81	Proposed Deferred Use	N/A	N/A	N/A	
SN-268	Supernate Transfer Line	AN	H-2-71989	Sep-81	Inspection/Test/Analysis	4B, 11A			
SN-636	Supernate Transfer Line	AN	H-14-103271	May-03	New Installation	W-314	N/A	RPP-15831 Rev. 0	
241-AP-01A	Central Pump Pit	AP	H-2-90553	Oct-86	Inspection / Refurbishment	[illegible]		Scheduled 2004	W-314

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
						314			
241-AP-01B	Annulus Pump Pit	AP	H-2-90553	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-02A	Central Pump Pit	AP	H-2-90554	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-AP-02B	Annulus Pump Pit	AP	H-2-90554	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-02D	Drain Pit	AP	H-2-90554	Oct-86	Proposed Deferred Use	N/A	N/A	N/A	
241-AP-03A	Central Pump Pit	AP	H-2-90555	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2005	W-314
241-AP-03B	Annulus Pump Pit	AP	H-2-90555	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-03D	Drain Pit	AP	H-2-90555	Oct-86	Proposed Deferred Use	N/A	N/A	N/A	
241-AP-04A	Central Pump Pit	AP	H-2-90556	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-AP-04B	Annulus Pump Pit	AP	H-2-90556	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-05A	Central Pump Pit	AP	H-2-90557	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-AP-05B	Annulus Pump Pit	AP	H-2-90557	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-06A	Central Pump Pit	AP	H-2-90558	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-AP-06B	Annulus Pump Pit	AP	H-2-90558	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-07A	Central Pump Pit	AP	H-2-90559	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-AP-07B	Annulus Pump Pit	AP	H-2-90559	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-08A	Central Pump Pit	AP	H-2-90560	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AP-08B	Annulus Pump Pit	AP	H-2-90560	Oct-86	Emergency Use	N/A	N/A	N/A	
241-AP-101	1,200,000 Gallon Waste Tank	AP	H-2-90553	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-13546 Rev. 0 (2003)		
241-AP-102	1,200,000 Gallon Waste Tank	AP	H-2-90554	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-AP-103	1,200,000 Gallon Waste Tank	AP	H-2-90555	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-13802 Rev. 0A (2003)		
241-AP-104	1,200,000 Gallon Waste Tank	AP	H-2-90556	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-AP-105	1,200,000 Gallon Waste Tank	AP	H-2-90557	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-15764 Rev. 0 (2003)		
241-AP-106	1,200,000 Gallon Waste Tank	AP	H-2-90558	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-AP-107	1,200,000 Gallon Waste Tank	AP	H-2-90559	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-6231 Rev. 0A (2000)		
241-AP-108	1,200,000 Gallon Waste Tank	AP	H-2-90560	Oct-86	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-6684 Rev. 0B (2002)		
241-AP-VP	Valve Pit	AP	H-2-90547	Oct-86	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2005	
241-VTP-SP-101	Seal Pot	AP	N/A	Oct-86	N/A	N/A	N/A	N/A	
DR-712	Drain Line	AP	H-2-90555	Oct-86	Analysis	7C			
DR-713	Drain Line	AP	H-2-90555	Oct-86	Analysis	7C			
DR-714	Drain Line	AP	H-2-90546	Oct-86	Analysis	7C			
DR-715	Drain Line	AP	H-2-90546	Oct-86	Analysis	7C			

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
DR-716	Drain Line	AP	H-2-90547	Oct-86	Analysis	7C			
PW-811	Annulus Pump Pit Return	AP	H-2-90553	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-812	Annulus Pump Pit Return	AP	H-2-90554	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-813	Annulus Pump Pit Return	AP	H-2-90555	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-814	Annulus Pump Pit Return	AP	H-2-90556	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-815	Annulus Pump Pit Return	AP	H-2-90557	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-816	Annulus Pump Pit Return	AP	H-2-90558	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-817	Annulus Pump Pit Return	AP	H-2-90559	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-818	Annulus Pump Pit Return	AP	H-2-90560	Oct-86	Emergency Use	N/A	N/A	N/A	
PW-823*	Leak Detection Pit Return	AP	H-2-90555	Oct-86	Proposed Deferred Use	N/A	N/A	N/A	
PW-825*	Leak Detection Pit Return	AP	H-2-90557	Oct-86	Proposed Deferred Use	N/A	N/A	N/A	
SL-509	Slurry Transfer Line	AP	H-2-90544	Oct-86	Inspection/Test/Analysis	4B, 11A			
SL-510	Slurry Transfer Line	AP	H-2-90544	Oct-86	Inspection/Test/Analysis	4B, 11A			
SL-511	Slurry Transfer Line	AP	H-2-90553	Oct-86	Inspection/Test/Analysis	4B, 11A			
SL-512	Slurry Transfer Line	AP	H-2-90554	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-04-759 4-5-05	Enc. Tested at 68psig
SL-513	Slurry Transfer Line	AP	H-2-90555	Oct-86	Inspection/Test/Analysis	4B, 11A			
SL-514	Slurry Transfer Line	AP	H-2-90556	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1438 6-11-04	Enc tested at 69psig
SL-515	Slurry Transfer Line	AP	H-2-90557	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1436 7-14-05	Enc. Tested at 68psig
SL-516	Slurry Transfer Line	AP	H-2-90558	Oct-86	Inspection/Test/Analysis	4B, 11A			

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
SL-517	Slurry Transfer Line	AP	H-2-90559	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1439 2-18-2005	Enc. tested at 69psig
SL-518	Slurry Transfer Line	AP	H-2-90560	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1440 7-13-05	Enc tested at 68psig
SN-611	Supernate Transfer Line	AP	H-2-90553	Oct-86	Inspection/Test/Analysis	4B, 11A			
SN-612	Supernate Transfer Line	AP	H-2-90554	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-04-759 4-5-05	Enc. Tested at 68psig
SN-613	Supernate Transfer Line	AP	H-2-90555	Oct-86	Inspection/Test/Analysis	4B, 11A			
SN-614	Supernate Transfer Line	AP	H-2-90556	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1438 6-11-04	Enc tested at 68psig
SN-615	Supernate Transfer Line	AP	H-2-90557	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1436 7-14-05	Enc. Tested at 69psig
SN-616	Supernate Transfer Line	AP	H-2-90558	Oct-86	Inspection/Test/Analysis	4B, 11A			
SN-617	Supernate Transfer Line	AP	H-2-90559	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1439 2-18-2005	Enc. tested at 69psig
SN-618	Supernate Transfer Line	AP	H-2-90560	Oct-86	Inspection/Test/Analysis	4B, 11A		2E-03-1440 7-13-05	Enc.tested at 68psig
SN-622	Supernate Transfer Line	AP	H-2-90554	Apr-02	New Installation	W-211		RPP-10535 Rev. 0	
SN-634	Supernate Transfer Line	AP	H-14-103270	Apr-02	New Installation	W-211		RPP-10535 Rev. 0	
SN-636	Supernate Transfer Line	AP	H-14-103271	Apr-02	New Installation	W-211		RPP-10535 Rev. 0	
SN-700	Supernate Transfer Line	AP	H-14-104900	Apr-02	New Installation	W-211		RPP-10535 Rev. 0	
SN-701	Supernate Transfer Line	AP	H-14-104892	Apr-02	New Installation	W-211		RPP-10535 Rev. 0	
204-AR	8,750 Gallon Waste Tank	AR	H-2-70682	Feb-88	Proposed Deferred Use	N/A	N/A	N/A	
241-AW-01A	Central Pump Pit	AW	H-2-70403	Aug-80	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2003	W-314

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AW-01B	Annulus Pump Pit	AW	H-2-70403	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-02A	Central Pump Pit	AW	H-2-70404	Aug-80	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2003	W-314
241-AW-02B	Annulus Pump Pit	AW	H-2-70404	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-02D	Drain Pit	AW	H-2-70404	Aug-80	Inspection / Refurbishment	6A, 6B, W-314		2003	W-314
241-AW-02E	Drain Pit	AW	H-2-70404	Aug-80	Deferred Use	N/A	N/A	N/A	
241-AW-03A	Central Pump Pit	AW	H-2-70405	Feb-04	Inspection / Refurbishment	6A, 6B, W-314		RPP-19430 Rev. 0	Pit Refurbished
241-AW-03B	Annulus Pump Pit	AW	H-2-70405	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-04A	Central Pump Pit	AW	H-2-70406	Aug-80	Inspection / Refurbishment	6A, 6B, W-314		2003	
241-AW-04B	Annulus Pump Pit	AW	H-2-70406	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-05A	Central Pump Pit	AW	H-2-70407	Feb-04	Inspection / Refurbishment	6A, 6B, W-314		RPP-19431 Rev. 0	Pit Refurbished
241-AW-05B	Annulus Pump Pit	AW	H-2-70407	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-06A	Central Pump Pit	AW	H-2-70408	Aug-80	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2003	W-314
241-AW-06B	Annulus Pump Pit	AW	H-2-70408	Aug-80	Emergency Use	N/A	N/A	N/A	
241-AW-101	1,200,000 Gallon Waste Tank	AW	H-2-70403	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-7018 Rev. 0A (2001)		
241-AW-102	1,200,000 Gallon Waste Tank	AW	H-2-70404	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-8698 Rev. 0A (2001) RPP-11581 Rev. 1 (2003)		

Table C-1 – ***Matrix of Components to be Assessed (17 pages)***

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AW-103	1,200,000 Gallon Waste Tank	AW	H-2-70405	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	SD-WM-TRP-282 Rev. 0 (1997)		
241-AW-104	1,200,000 Gallon Waste Tank	AW	H-2-70406	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-11582 Rev. 0 (2002)		
241-AW-105	1,200,000 Gallon Waste Tank	AW	H-2-70407	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-8149 Rev. 0A (2001)		
241-AW-106	1,200,000 Gallon Waste Tank	AW	H-2-70408	Aug-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-10776 Rev. 0 (2002)		
241-AW-A	Valve Pit	AW	H-2-70401	Nov-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-13624 Rev. 0	Pit Refurbished
241-AW-B	Valve Pit	AW	H-2-70401	Jun-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-11060 Rev. 0	Pit Refurbished
COB-A-30	Clean Out Box	AW	H-2-70398	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-1	Clean Out Box	AW	H-2-70398	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-10	Clean Out Box	AW	H-2-70406	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-11	Clean Out Box	AW	H-2-70398	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-12	Clean Out Box	AW	H-2-70399	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-2	Clean Out Box	AW	H-2-70398	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-3	Clean Out Box	AW	H-2-70398	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-4	Clean Out Box	AW	H-2-70398	Aug-80	[illegible]	N/A	N/A	N/A	E-525

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
					service				
COB-AW-5	Clean Out Box	AW	H-2-70399	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-6	Clean Out Box	AW	H-2-70399	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-7	Clean Out Box	AW	H-2-70399	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-8	Clean Out Box	AW	H-2-70399	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
COB-AW-9	Clean Out Box	AW	H-2-70405	Aug-80	N/A – to be removed from service	N/A	N/A	N/A	E-525
DR-334	Drain Line	AW	H-2-70404	Aug-80	Analysis	7C			
DR-335	Drain Line	AW	H-2-70404	Aug-80	Analysis	7C			
DR-338	Drain Line	AW	H-2-69354	Aug-80	Analysis	7C			
DR-339	Drain Line	AW	H-2-69183	Aug-80	Analysis	7C			
DR-343	Drain Line	AW	H-2-70404	Aug-80	Analysis	7C			
DR-361	Drain Line	AW	H-2-70401	Aug-80	Analysis	7C			
DR-369	Drain Line	AW	H-2-70401	Aug-80	Analysis	7C			
DR-371	Drain Line	AW	H-2-70404	Aug-80	Analysis	7C			
DR-374	Drain Line	AW	H-2-70399	Aug-80	Analysis	7C			
PW-461*	Annulus Leak Detection Return	AW	H-2-70403	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
PW-462*	Annulus Leak Detection Return	AW	H-2-70404	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
PW-463*	Annulus Leak Detection Return	AW	H-2-70405	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
PW-464*	Annulus Leak Detection Return	AW	H-2-70406	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
PW-465*	Annulus Leak Detection Return	AW	H-2-70407	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
PW-466*	Annulus Leak Detection Return	AW	H-2-70408	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
PW-471	Annulus Pump Pit Return	AW	H-2-70403	Aug-80	Emergency Use	N/A	N/A	N/A	
PW-472	Annulus Pump Pit Return	AW	H-2-70404	Aug-80	Emergency Use	N/A	N/A	N/A	
PW-473	Annulus Pump Pit Return	AW	H-2-70405	Aug-80	Emergency Use	N/A	N/A	N/A	
PW-474	Annulus Pump Pit Return	AW	H-2-70406	Aug-80	Emergency Use	N/A	N/A	N/A	
PW-475	Annulus Pump Pit Return	AW	H-2-70407	Aug-80	Emergency Use	N/A	N/A	N/A	
PW-476	Annulus Pump Pit Return	AW	H-2-70408	Aug-80	Emergency Use	N/A	N/A	N/A	
SL-162	Slurry Transfer Line	AW	H-2-70404	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SL-163	Slurry Transfer Line	AW	H-2-70405	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SL-164	Slurry Transfer Line	AW	H-2-70406	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SL-165	Slurry Transfer Line	AW	H-2-70405	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SL-166	Slurry Transfer Line	AW	H-2-70406	Aug-80	Inspection/Test/Analysis	4B, 11A			
SL-167	Slurry Transfer Line	AW	H-2-70398	Aug-80	Inspection/Test/Analysis	4B, 11A			
SL-168	Slurry Transfer Line	AW	H-2-70398	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SL-169	Slurry Transfer Line	AW	H-2-70401	Aug-80	Inspection/Test/Analysis	4B, 11A			
[illegible]	Supernate Transfer Line	AW	H-2-70401	Aug-80	Inspection/Test/Analysis	4B, 11A			

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
LIQW-702									
SN-261	Supernate Transfer Line	AW	H-2-70403	Aug-80	Deferred Use	N/A	N/A	N/A	
SN-262	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A		2E-04-01337/W 1-3-2005	Enc. Tested at 69psig
SN-263	Supernate Transfer Line	AW	H-2-70405	Aug-80	Proposed Deferred Use	N/A	N/A	N/A	
SN-264	Supernate Transfer Line	AW	H-2-70406	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-265	Supernate Transfer Line	AW	H-2-70405	Aug-80	Deferred Use	N/A	N/A	N/A	
SN-266	Supernate Transfer Line	AW	H-2-70406	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-267	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-268	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-269	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-270	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-271	Supernate Transfer Line	AW	H-2-70401	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-272	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-274	Supernate Transfer Line	AW	H-2-70406	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-609	Supernate Transfer Line	AW	H-2-70404	Aug-80	Inspection/Test/Analysis	4B, 11A			
SN-610	Supernate Transfer Line	AW	H-2-70399	Aug-80	Inspection/Test/Analysis	4B, 11A			
241-AY-01A	Central Pump Pit	AY	H-2-64405	Jul-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-11217 Rev. 0	W-314
241-AY-01B	Annulus Pump Pit	AY	H-2-64405	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-01C	Drain Pit	AY	H-2-64405	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-01D	Drain Pit	AY	H-2-64405	Apr-80	Deferred Use	N/A	N/A	N/A	

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-AY-01E	Drain Pit	AY	H-2-64405	Apr-80	Proposed Deferred Use	N/A	N/A	N/A	
241-AY-01F	Drain Pit	AY	H-2-64405	Apr-80	Emergency Use	N/A	N/A	N/A	
241-AY-02A	Central Pump Pit	AY	H-2-64406	Jul-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-11217 Rev. 0	W-314
241-AY-02B	Annulus Pump Pit	AY	H-2-64406	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-02C	Drain Pit	AY	H-2-64406	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-02D	Drain Pit	AY	H-2-64406	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-02E	Drain Pit	AY	H-2-64406	Apr-80	Deferred Use	N/A	N/A	N/A	
241-AY-02F	Drain Pit	AY	H-2-64406	Apr-80	Emergency Use	N/A	N/A	N/A	
241-AY-101	1,000,000 Gallon Waste Tank	AY	H-2-64405	Apr-80	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-8519 Rev. 0A (2001)		
241-AY-102	1,000,000 Gallon Waste Tank	AY	H-2-64406	Apr 1980 (est)	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-4818 Rev. 0 (1999)		
DR-0051	Drain Line	AY	H-2-64405	Apr-80	Analysis	7C			
DR-0054	Drain Line	AY	H-2-64406	Apr-80	Analysis	7C			
DR-0068	Drain Line	AY	H-2-64405	Apr-80	Analysis	7C			
DR-0069	Drain Line	AY	H-2-64406	Apr-80	Analysis	7C			
DR-0070	Drain Line	AY	H-2-64405	Apr-80	Analysis	7C			
DR-0072	Drain Line	AY	H-2-64405	Apr-80	Analysis	7C			
DR-0073	Drain Line	AY	H-2-64406	Apr-80	Analysis	7C			
DR-AY1	Drain Line	AY	TBD	TBD	TBD	TBD	TBD	TBD	
DR-AY2	Drain Line	AY	TBD	TBD	TBD	TBD	TBD	TBD	

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
PW-4531	Annulus Pump Pit Return	AY	H-2-64405	Apr-80	Emergency Use	N/A	N/A	N/A	Should be PW-4331
PW-4532	Annulus Pump Pit Return	AY	H-2-64406	Apr-80	Emergency Use	N/A	N/A	N/A	
SL-100	Slurry Transfer Line	AY	H-2-64406	Sep-96	Proposed Deferred Use	N/A	N/A	N/A	
SN-200	Supernate Transfer Line	AY	H-2-64406	Sep-96	Proposed Deferred Use	N/A	N/A	N/A	
SN-633	Supernate Transfer Line	AY	H-14-102620	Jul-02	New Installation	N/A	N/A	RPP-11217 Rev. 0	W-314
SN-635	Supernate Transfer Line	AY	H-14-102620	Jul-02	New Installation	N/A	N/A	RPP-11217 Rev. 0	W-314
241-AZ-01A	Central Pump Pit	AZ	H-2-68353	Jul-02	Inspection / Refurbishment	6A, 6B, W-314		RPP-11218 Rev. 0	W-314
241-AZ-01B	Annulus Pump Pit	AZ	H-2-68353	Nov-76	Deferred Use	N/A	N/A	N/A	
241-AZ-01C	Drain Pit	AZ	H-2-68353	Nov-76	Deferred Use	N/A	N/A	N/A	
241-AZ-01F	Drain Pit	AZ	H-2-68353	Nov-76	Emergency Use	N/A	N/A	N/A	
241-AZ-02A	Central Pump Pit	AZ	H-2-68413	Jul-02	Inspection / Refurbishment	6A, 6B, W-314	N/A	RPP-11218 Rev. 0	
241-AZ-02B	Annulus Pump Pit	AZ	H-2-68413	Nov-76	Deferred Use	N/A	N/A	N/A	
241-AZ-02C	Drain Pit	AZ	H-2-68413	Nov-76	Deferred Use	N/A	N/A	N/A	
241-AZ-02F	Drain Pit	AZ	H-2-68413	Nov-76	Emergency Use	N/A	N/A	N/A	
241-AZ-101	1,000,000 Gallon Waste Tank	AZ	H-2-68413	Nov-76	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-4819 Rev. 0 (1999)		
241-AZ-102	1,000,000 Gallon Waste Tank	AZ	H-2-68353	Nov-76	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-15765 Rev. 0 (2003)		W-314
241-AZ-PC-SP-1	Seal Pot	AZ	N/A	N/A	New Installation	N/A	N/A	N/A	E-525
241-AZ-VP	Valve Pit	AZ	H-14-103263	May-03	New Installation	[illegible]	N/A	RPP-16278 Rev. 0	[illegible]

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
						314			Liner
DR-0077	Drain Line	AZ	H-2-68353	Nov-76	Analysis	7C			
DR-0080	Drain Line	AZ	H-2-68353	Nov-76	Analysis	7C			
DR-0090	Drain Line	AZ	H-2-68413	Nov-76	Analysis	7C			
DR-0091	Drain Line	AZ	H-2-68413	Nov-76	Analysis	7C			
DR-100	Drain Line	AZ	H-14-103263	Jul-02	New Installation			RPP-11218 Rev. 0	
DR-AZ1	Drain Line	AZ	TBD	TBD	New Installation	N/A	N/A	TBD	E-525
DR-AZ2	Drain Line	AZ	TBD	TBD	New Installation	N/A	N/A	TBD	E-525
PC-AZ-503	Drain Line	AZ	TBD	TBD	New Installation	N/A	N/A	N/A	
PW-405	Diluent/Flush	AZ	N/A	N/A	N/A	N/A	N/A	N/A	W-211
PW-4609	Annulus Pump Pit Return	AZ	H-2-68353	Nov-76	Emergency Use	N/A	N/A	N/A	
PW-4623	Annulus Pump Pit Return	AZ	H-2-68413	Nov-76	Emergency Use	N/A	N/A	N/A	
SN-630	Supernate Transfer Line	AZ	H-14-101110	May-03	New Installation	N/A	N/A	RPP-15831 Rev. 0	W-314
SN-631	Supernate Transfer Line	AZ	H-2-68413	Jul-02	New Installation	N/A	N/A	RPP-11218 Rev. 0	W-314
SN-632	Supernate Transfer Line	AZ	H-2-68413	Jul-02	New Installation	N/A	N/A	RPP-11218 Rev. 0	W-314
SN-637	Supernate Transfer Line	AZ	H-14-103263	Apr-02	New Installation	N/A	N/A	RPP-10535 Rev. 0	W-211
241-SY-01A	Central Pump Pit	SY	H-2-37801	Apr-77	Deferred Use	N/A	N/A	N/A	
241-SY-01B	Annulus Pump Pit	SY	H-2-37801	Apr-77	Emergency Use	N/A	N/A	N/A	
241-SY-02A	Central Pump Pit	SY	H-2-37802	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-SY-02B	Annulus Pump Pit	SY	H-2-37802	Apr-77	Emergency Use	N/A	N/A	N/A	

Table C-1 – *Matrix of Components to be Assessed (17 pages)*

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
241-SY-02D	Drain Pit	SY	H-2-37802	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2003	W-314
241-SY-02E	Drain Pit	SY	H-2-37802	Apr-77	Deferred Use	N/A	N/A	N/A	
241-SY-02E	Drain Pit	SY	H-2-37802	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-SY-03A	Central Pump Pit	SY	H-2-37803	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
241-SY-03B	Annulus Pump Pit	SY	H-2-37803	Apr-77	Emergency Use	N/A	N/A	N/A	
241-SY-101	1,200,000 Gallon Waste Tank	SY	H-2-37801	Apr-77	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-SY101-PPP	Prefabricated Pump pit	SY	H-14-103571	Sep-99	Proposed Deferred Use	N/A	N/A	N/A	
241-SY-102	1,200,000 Gallon Waste Tank	SY	H-2-37802	Apr-77	Inspection / Analysis	5A, 5B, 5C, 5D, 5E			
241-SY-103	1,200,000 Gallon Waste Tank	SY	H-2-37803	Apr-77	Inspection / Analysis	5A, 5B, 5C, 5D, 5E	RPP-18446 Rev. 0 (2004)		
241-SY-A	Valve Pit	SY	H-2-37780	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2003	W-314
241-SY-B	Valve Pit	SY	H-2-37780	Apr-77	Inspection / Refurbishment	6A, 6B, W-314		Scheduled 2004	W-314
DR-376	Drain Line	SY	H-2-37778	Apr-77	Analysis	7C			
DR-377	Drain Line	SY	H-2-37778	Apr-77	Analysis	7C			
DR-378	Drain Line	SY	H-2-37778	Apr-77	Analysis	7C			
DR-379	Drain Line	SY	H-2-37778	Apr-77	Analysis	7C			
DR-386	Drain Line	SY	H-2-37802	Apr-77	Analysis	7C			

Table C-1 – ***Matrix of Components to be Assessed (17 pages)***

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
DR-387	Drain Line	SY	H-2-37778	Apr-77	Analysis	7C			
PW-475	Annulus Pump Pit Return	SY	H-2-37802	Apr-77	Emergency Use	N/A	N/A	N/A	
PW-476*	Annulus Leak Detection Return	SY	H-2-37802	Apr-77	Proposed Deferred Use	N/A	N/A	N/A	
PW-477	Annulus Pump Pit Return	SY	H-2-37801	Apr-77	Emergency Use	N/A	N/A	N/A	
PW-478*	Annulus Leak Detection Return	SY	H-2-37801	Apr-77	Proposed Deferred Use	N/A	N/A	N/A	
PW-479	Annulus Pump Pit Return	SY	H-2-37803	Apr-77	Emergency Use	N/A	N/A	N/A	
PW-480*	Annulus Leak Detection Return	SY	H-2-37803	Apr-77	Proposed Deferred Use	N/A	N/A	N/A	
SL-177	Slurry Transfer Line	SY	H-2-37802	TBD	To Be Replaced	N/A	N/A	N/A	
SL-178	Slurry Transfer Line	SY	H-2-37801	Apr-77	Emergency Use	N/A	N/A	N/A	
SL-179	Slurry Transfer Line	SY	H-2-37803	Apr-77	Emergency Use	N/A	N/A	N/A	
SL-180	Slurry Transfer Line	SY	H-2-37778	Apr-77	Inspection/Test/Analysis	4B, 11A			
SLL-3160	SLL Transfer Line	SY	H-2-822210	Nov-97	Proposed Deferred Use	N/A	N/A	RPP-16278 Rev. 0	
SN-277	Supernate Transfer Line	SY	H-2-37802	Apr-77	New Installation	N/A	N/A	N/A	
SN-278	Supernate Transfer Line	SY	H-2-37801	Apr-77	Emergency Use	N/A	N/A	N/A	
SN-279	Supernate Transfer Line	SY	H-2-37803	Apr-77	Emergency Use	N/A	N/A	N/A	
SN-280	Supernate Transfer Line	SY	H-2-37778	Apr-77	Inspection/Test/Analysis	4B, 11A			
SN-285	Supernate Transfer Line	SY	H-2-37802	TBD	To Be Replaced	N/A	N/A	N/A	
SN-286	Supernate Transfer Line	SY	H-2-37802	TBD	To Be Replaced	N/A	N/A	N/A	
SNL-3150	Supernate Transfer Line	SY	H-2-822210	Nov-97	Inspection/Test/Analysis	4B, 11A		RPP-16278 Rev. 0	RPP-16278 [illegible]

Table C-1 – ***Matrix of Components to be Assessed (17 pages)***

Component ID	Description	Farm	Drawing	Service Date	Assessment Method	Applicable Task ID	Inspection Reports	Assessment Reference	Comments
									244-A to the AN, AZ, and AP Farms
SNL-5350	Supernate Transfer Line	SY	H-14-105612	Mar-04	New Installation, Inspection/Test/Analysis	4B, 11A		RPP-20512 Rev. 0	
SNL-5351	Supernate Transfer Line	SY	H-14-105612	Mar-04	New Installation, Inspection/Test/Analysis	4B, 11A		RPP-20512 Rev. 0	
SY-101 OGT	Hose In Hose Transfer Line	SY	H-14-103595	Sep-99	Proposed Deferred Use	N/A	N/A	N/A	
6241-A	Diversion Box	200W	H-2-822202	Nov-97	Inspection / Analysis	6A, 6B			
6241-V	Vent Station	600	H-6-13978	Nov-97	Inspection / Analysis	6A, 6B			