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1	1	Cog.Eng. E. J. Walter	E J Walter	12/14/95	H5-52						
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		QA									
		Safety									
1	1	Env. E. M. Greager	E M Greager	12/14/95							
1	1	S. E. Killoy	S. E. Killoy	12/14/95	S6-70						
1	1	D. W. Wilson	D W Wilson	12/14/95							

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B PLANT LOW LEVEL WASTE SYSTEM INTEGRITY ASSESSMENT REPORT

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Abstract: This document provides the report of the integrity assessment activities for the B Plant low level waste system. The assessment activities were in response to requirements of the Washington State Dangerous Waste Regulations, Washington Administrative Code (WAC), 173-303-640. This integrity assessment report supports compliance with Hanford Federal Facility Agreement and Consent Order interim milestone target action M-32-07-T03.

Janis Bishop 12-15-95
Release Approval Date Release Stamp

Approved for Public Release

INDEPENDENT, QUALIFIED,
REGISTERED PROFESSIONAL ENGINEER
(IQRPE)

CERTIFICATION OF
B PLANT LOW LEVEL WASTE SYSTEM
INTEGRITY ASSESSMENT REPORT

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments. Based on this and on my inquiry of those individuals immediately responsible for getting the 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."

12 DEC 95
Date

Certification

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STATE OF WASHINGTON
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REGISTERED PROFESSIONAL ENGINEER
EXPIRES 12/3/95

Cecil Paul Warbington

CONTENTS

B PLANT LOW LEVEL WASTE SYSTEM INTEGRITY ASSESSMENT REPORT

1.0 INTRODUCTION

The Westinghouse Hanford Company (WHC) manages tank systems for the United States Department of Energy-Richland Operations (DOE-RL) that contain dangerous waste constituents as defined by the Dangerous Waste Regulations, in the Washington Administrative Code (WAC) 173-303-040. Chapter 173-303-640(2) of the WAC and 40 CFR 265.191, Subpart J, require the performance of an integrity assessment for each existing tank system that stores or treats dangerous waste. In response to this WAC requirement, the B Plant Low Level Waste System Integrity Assessment Plan (IAP), WHC-SD-WM-WP-245, was prepared to provide a plan for performing this integrity assessment of the tank system. This integrity assessment report supports compliance with Hanford Facility Agreement and Consent Order interim milestone target action M-32-07-T03.

2.0 OBJECTIVE

The objective is to evaluate the results of the assessment activities and to determine whether the tank system is adequately designed and has sufficient structural strength and compatibility with the waste to be stored to ensure that it will not collapse, rupture or fail.

The following was considered:

Design standards - Using the original construction codes and standards, identify and evaluate for adequacy the criteria to which the system was constructed and maintained,

Waste Characteristics - identify the waste and evaluate the adequacy of design to handle the waste,

Corrosion Protection Measures - evaluate the design and the operational practices for corrosion protection,

Age - document, estimate, or otherwise determine the approximate age of the system,

Integrity Examination - identify the materials, identify the waste (past and projected), identify the existing condition of the material based upon leak testing, visual examination, and repairs.

3.0 SCOPE

The scope, which differs from the IAP to reflect system changes, includes tanks Tk 24-1, Tk 25-2, and ancillary equipment including discharge piping to the facility boundary (west wall). Also included are those portions of the facility that serve as secondary containment for the system. See Figure 1, B Plant Low Level Waste Tank System, for a general description of the system. Tk 25-2 is intended for use as a one-time storage tank.

NOTE: Tk 25-2 contains waste, but there is no intent to add to the existing inventory of this tank. Routes to remove the waste from the tank have not been identified nor has a removal schedule been finalized. Once identified, the ancillary equipment used to remove the waste from Tk 25-2 will be tested prior to, and visually monitored during, the waste transfer.

The detailed scope of the low level waste tank system being evaluated and assessed is as follows:

Components	Pertinent Drawings
Tk 24-1 Low Level Waste Collector -	H-2-40488, H-2-60924,
Tank supports	H-2-40488, H-2-60336, HW-69880, HW-69881,
Tk 25-2 Low Level Waste Collector	H-2-40474, H-2-60925,
Tank supports	H-2-40474, H-2-60336, HW-69880, HW-69881,
Piping	
Piping in hot pipe trench,	H-2-61026 thru H-2-61048,
Tk 24-1 (F) to hot pipe trench (line 206)	H-2-61026, H-2-60885, H-2-60896,
Jumpers 206 to 23/24-10, 31/32-8 to 31/32-10, and 39/40-8 to line 244 nozzle in hot pipe trench	H-2-34217, H-2-61026, H-2-61034, H-2-61047,

Supports - cells and hot pipe trench	H-2-60885, H-2-61026, HW-69880, HW-69881

(See Appendix A for additional references),

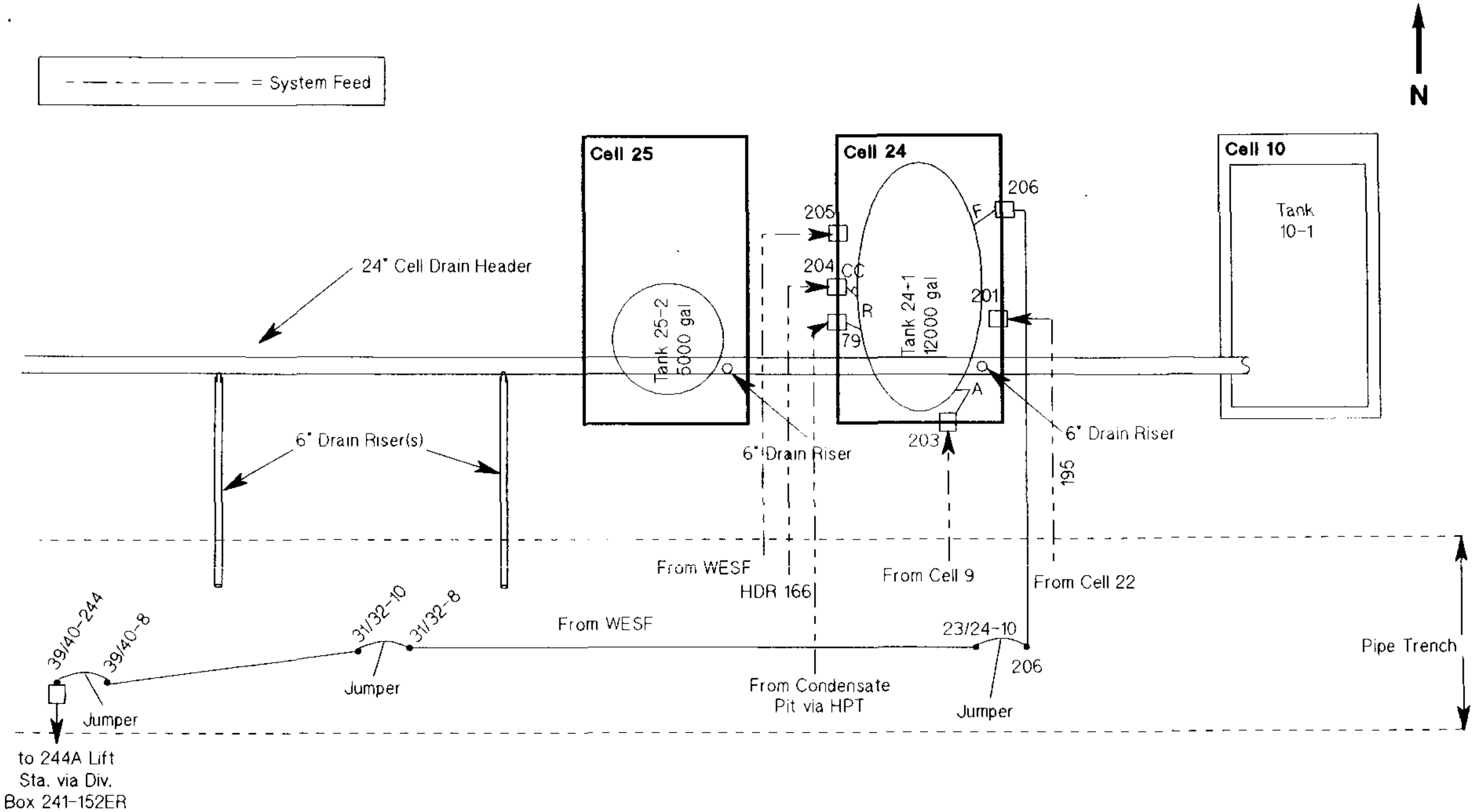

Figure 1. B Plant Low Level Waste Tank System

Secondary containment

Cell 24 and Cell 25	W-69565, W-69566,
6" drain risers from cell 25 & the hot pipe trench to the 24" cell drain header, the cell drain header from cell 25 to Tk 10-1 in cell 10.	W-69565, W-69566,
24" Cell Drain Header	W-69333, W 69566,
Cell 10	W-69994,
Tk 10-1	H-2-60910, Detail 61881,
Hot pipe trench	W-69565, W-69566.

Although tank Tk 25-2 is not being used as a part of the low level waste system, it is being used to store aqueous waste generated during organic solvent washes.

4.0 DESCRIPTION

The following sections provide the system and function description, design requirements, waste characteristics, corrosion protection measures, age, and other factors used in evaluating the design and assessing the condition of the system. Appendix A contains a list of specifications and drawings for reference.

4.1 DESCRIPTION AND FUNCTION OF THE LOW LEVEL WASTE SYSTEM

The existing configuration of the Low Level Waste System was established as a portion of Projects CAC-144 and CAC-181 in the mid-1960s, which reworked much of the facility. Since then, it has been revised as the facility needs have changed. Presently, most of the system is located in cell 24, cell 10 and the hot pipe trench. Tk 24-1 receives effluent from Tk 10-1, WESF, and other condensate drains. The pH of the effluent is adjusted in Tk 24-1 through the addition of sodium hydroxide solution. Sodium nitrite is also added to the waste to meet tank farm specifications. After treatment in Tk 24-1, pump P-24-1-2 is used to transfer the waste to the tank farms. Transfer flow rate and pressure are approximately 20 gal/min and 60 lb_f/in^2 (1.2E-03 m^3/s and 413 E+03 Pa). Tk 25-2, after removal of the existing waste inventory, will be removed from service.

Tk 24-1 has a capacity of 12,000 gallons (45.4 m^3), however, the operating capacity is limited to 7,500 gallons (28.4 m^3) to ensure that the capacity of secondary containment is not exceeded in the case of a leak. The tank is equipped with internal cooling coils, which are no longer in use.

Administration procedures and alarms prevent accumulating inventory beyond the set limits.

The system may handle up to 14,000 gal/month (52.9 m^3/m). Waste input to the tank is mostly water received by gravity flow at ambient temperature.

Tk 25-2, which is intended for use as a one-time storage tank, has a capacity of 5,000 gallons (18.9 m^3), however, the operating capacity is limited to 2,900 gallons (10.9 m^3).

The floor of cell 24, cell 25, and the hot pipe trench are sloped to drains. Cells 24 and 25, as other cells, drain to the B Plant Cell Drain Header. The header in turn drains to Tk 10-1 in cell 10, which serves as a common sump for all of the cells and the hot pipe trench in the 221-B building. The hot pipe trench has drains at 40 foot (12.9 m) intervals which are routed directly to the cell drain header.

Cell 10, which contains Tk 10-1 (part of the secondary containment system), is located at a lower elevation than the other cells to permit gravity draining. Cover blocks, along with the negative cell pressure, provide a design to prevent the escape of airborne radioactive contamination from the cells to the canyon deck, and provide shielding of the high intensity radiation emanating from the process waste.

Cell 10 is equipped with a sump (tertiary containment) and sump pump that collects and discharges into Tk 10-1 any accumulated leakage or spillage in the cell. Leak detection of the system is accomplished by continuously monitoring the inventory in tanks Tk 10-1, Tk 24-1, Tk 25-2, and the cell 10 sump. Any unaccountable change of any of the four inventories indicates primary or secondary containment in-leakage or out-leakage.

All lines which service cell 24 are embedded in concrete and terminate in a row of "connector nozzles" on the cell walls nine feet (2.74 m) below canyon deck level. Tk 24-1 and Tk 25-2 are placed on the cell floor and held in position by guides built into the cell, thus establishing a standard relationship between the wall connector nozzles and vessels.

4.2 DESIGN STANDARDS

The following sections contain the design standards found for the low level waste system.

4.2.1 Waste Tank Design Standards

Tk 24-1 and Tk 25-2 were constructed with stainless steel, Type 347, in accordance with General Specification for Material Procurement and Shop Fabrication of Class I, II, & III Vessels, HW-4311, Rev. 2, dated October 25, 1950.

"Class I vessels required all-welded stainless steel construction with carbon steel used only for necessary external attachments. The carbon steel attachments are protected with a coating of Amercoat[1] and are not in contact with process solutions. Double butt welds are used for pressure-holding seams, where possible. The quality of the welds is controlled by radiographic testing or by other specialized techniques depending upon the location of the weld."

Tk 24-1 and Tk 25-2 were constructed to Class I requirements. This "Class I" classification is not related to the existing Hanford safety classification for systems or components.

Specification HW-4311 required that the longitudinal and circumferential vessel welds be examined by radiography in accordance with the ASME Code for Unfired Pressure Vessels, Section VIII, paragraph U-68. The material was required to conform to the physical and chemical properties of ASTM A-167, Grade 6. Material certification and corrosion coupons were required.

The drawings required welding in accordance with the ASME Code for Unfired Pressure Vessels, Section VIII, Items C and D of Paragraph U-69 and related sections of U-59, U-67, U-72, U-73, and U-78. The welding qualification procedures were in accordance with Welding Qualifications, Section IX of the same code.

In review of the design documentation, no seismic requirements or evidence of seismic capabilities for either Tk 24-1 or Tk 25-2 were found. To determine the effect of a seismic event a scoping analysis of Tk 24-1 was performed. This analysis predicts tank wall stresses in the area of the trunnion assemblies will exceed the ASME code allowable stresses for the material significantly. The details of this analysis may be found in the attachments to letter #ETS-W-96-94, J. S. Huisingh to E. J. Walter, dated October 11, 1995. The trunnion assemblies are not designed or intended to serve as seismic supports. They are used to precisely locate the tanks in the cells relative to cell nozzles. Seismic analysis of Tk 25-2 was not performed because its failure is unlikely. This conclusion "is based upon review of the Tk 24-1 analysis" and differences in design and capacity. The greater wall thickness and the lower inventory of Tk 25-2 are the principal reasons for this conclusion.

These waste tanks, originally assigned to U plant, were refurbished by Project CAC-144 in the 1960s for use in the B Plant low level waste system.

<u>Tk-24-1</u>

The detail design requirements for Tk 24-1 are shown on Drawing H-2-40488. The tank wall is fabricated from 1/4 inch (6.35 E-03 m) thick plate and the lower and upper heads from 1/2 inch (1.27 E-02 m) thick plate. Plate strips were welded to the walls and the upper head to stiffen and provide baffling. The cooling coils were constructed of 2" schedule 40 pipe. The drawing specifies Type 347 cooling coil material in accordance with specification HW-4311, Rev. 2.

[1]Amercoat is a product of the Ameron Company.

Tk 25-2

The detail design requirements for Tk 25-2 are shown on Drawing H-2-40474. The tank walls are fabricated from 5/8 inch (1.58 E-02 m) thick plate and the lower and upper heads from 1/2 inch (1.27 E-02 m) thick plate. Stiffening of the upper head and baffling is provided by welding plate material to the inner surface of the tanks. The cooling coil design for this tank is shown on Dwg. H-2-60950. The cooling coils are fabricated 2" schedule 40 pipe using ASTM A-312 piping and A-403 pipe fitting 304L stainless steel material. The cooling coils are designed for 70 °F (21 °C) inlet and 80 °F (27 °C) outlet water in tank liquid at 130°F (54 °C). The coils were hydrostatically tested at 150 lbs/in^2 (1,034 E+03 Pa) pressure.

The design includes a cooling jacket welded to the exterior surface of the shell of the tank to provide additional cooling, but, reportedly, never used. The jacket was constructed using 3/16-inch (4.76 E-03 m) thick plate forming an approximate 3/4-inch (.019 m) wide cooling annulus for 12 (3.6 m) of the 14 foot (4.2 m) height of the tank. The cooling coils in the tanks are no longer in service because the liquid waste is now near ambient temperature, therefore, cooling is not required.

The tank wall thicknesses exceed the needs to withstand the hydraulic loading on these tanks. There are a number of tanks providing similar liquid waste storage service with 10 gauge (3.42 E-03 m) wall thicknesses. The design adequacy of these thinner walled tanks is documented in WHC-SD-WM-DA-052. The apparent purpose of the sturdy design of Tk 24-1 and Tk 25-2 is to provide configuration stability for the equipment mounted on top of the tanks and to ensure that the rigid tank to wall nozzle jumpers are fit leak tight.

4.2.2 Waste Tank Ancillary Equipment Design Standards

The ancillary equipment consists of the piping, jumpers, and pump.

4.2.2.1 Waste Piping. The low level waste piping consists of piping installed during refurbishing projects, most of which was added by Project CAC-144. A thermal analysis to determine whether the system is adequately designed to withstand the operational thermal loadings has not been found.

Project CAC-144, CAC-181, and associated projects cleared the hot pipe trench of most of the piping and installed new piping. These projects also installed additional embedded piping runs between the cell 24 and the hot pipe trench. As a result, all of the low level waste system piping was installed during the 1960s or later.

Project CAC-144, HW-81802, required all piping in cell 24 or the hot pipe trench piping to be 2" schedule 40, Type 304L stainless steel in accordance with Piping Code M-21, Drawing H-2-31750, Sh. 21, unless otherwise noted on drawings. The Piping Code M-21 identifies the maximum operating pressure as 150 psig (1,034 E+03 Pa) and the maximum operating temperature as 370 °F (187 °C).

The hot pipe trench Drawing H-2-61040 requires a dye penetrant test of the first pass and the last pass of welds to existing piping and dye penetrant test of the last pass of new piping welds. Radiographic testing of 10% of welds to existing lines and 5% of welds in new lines was required. Hydrostatic testing of this new/existing piping was not required.

The supports for the new hot pipe trenching piping were detailed in drawings H-2-61038, H-2-61039, H-2-61040 and H-2-61044. The piping is attached to structural steel supports by U-bolts. The new arrangement for the in-cell piping for cell 24 is shown on drawing H-2-60885.

All carbon steel used in the hot pipe trench or the cells for support of the tanks, pipe, or other equipment received a .005 inch (.00012 m) coat of Amercoat #33, or equal, followed by a final coat gray. Surface preparation required "white metal blast cleaning" per SSPC-SP5-52T, Steel Structures Painting Council, which is needed for very corrosive atmospheres.

4.2.2.2 Other Equipment. Project CAC-144 fitted Tk 24-1 with an agitator to minimize sediment. Tk 24-1 is equipped with an electrically driven pump rated at 50 gal/min (.003 m^3/s) at 90-foot (27.4-m) head for the normal transfer of liquid waste to the tank farms.

Drawing H-9-1069, Pump Vertical Turbine Stainless Steel, provides design and operating criteria for the electrically driven pumps. Stainless steel material, type 304L, is required for the wetted metal parts. No provision was found for cast stainless material. The maximum temperature is specified as 180 °F (82 °C). A run-in test is conducted on all pumps to assure adequate performance before installation in the tanks.

Jumpers, which are remotely removable sections of piping, are fabricated in accordance with HS-BS-0084, Jumper Fabrication. The jumper material is stainless steel. The jumpers are hydrostatically pressure tested at 100 lb_f/in^2 (689 E+03 Pa) unless otherwise noted on the drawing.

4.2.3 Secondary Containment

The 221-B building, which houses and supports the low level waste system, was constructed as a reinforced concrete structure, in the early 1940s, as a part of Project 9536. Many design drawings for the original design are available, but, the design specifications followed during the original construction have not been found.

The hot pipe trench, cell 24, and cell 25 were also refurbished in the 1960s, mainly by Projects CAC-144 and CAC-181. No significant rework of the other portions of the secondary containment were found.

The original seismic design requirements or analysis to demonstrate a capability for seismic loading have not been found. During the 1970s preliminary analyses were performed to determine the seismic loading capability of the facility. These were the first seismic analyses known to have been performed. In 1989, B Plant Canyon Structure Seismic Evaluation, WHC-SD-WM-SA-005, Rev. 0, was issued to demonstrate that the unmodified structure was in compliance with the Hanford Facilities Design Criteria, SDC-4.1, Rev. 11 (1989).

Compliance with SDC-4.1 seismic requirements assures that the structural capacity of the canyon building will not be exceeded (i. e. no collapse) during a Design Basis Earthquake. However, through-wall cracking in the confinement boundary near the wall/roof intersection is not precluded. The secondary containment for the low level waste system would not be affected by these cracks.

Based upon the results of the analysis it was concluded that the canyon was in compliance with the seismic requirements specified in SDC-4.1.

In 1991, B Plant Cell Drain Header Seismic Analysis, WHC-SD-W024H-SA-001, found the cell drain header to satisfy the Department of Energy requirements for seismic resistance. This analysis concluded that minor cracking not affecting the functional capability of the cell drain header could occur.

The secondary containment for the low level waste system consists of: 1) Cell 24; 2) Cell 25; 3) The section of hot pipe trench from cell 23 thru cell 40; 4) The 24" cell drain header; 5) Tk 10-1; 6) Cell 10; and 7) The 6" drain risers from cell 24, cell 25 and the hot pipe trench, and 8) The cell drain header.

<u>Cell 24 & 25</u> - Cell 24 & 25, are standard canyon cells, 17 feet 8 inches (5.38 m) long, 13 feet (3.96 m) wide, and 22 feet (6.70 m) deep. They are separated from adjacent cells by a seven-foot (2.13 m) thick concrete wall and are equipped with six-foot (1.82 m) thick cover blocks. The construction of the cells is reinforced concrete as noted above. A protective coating was applied to the lower 2 feet (.60 m) of the wall and the floor surfaces as part of the 1960s refurbishment.

<u>Hot pipe trench</u> - The hot pipe trench is approximately 8 feet (2.43 m) wide, 6 feet (1.82 m) deep, and runs from Cell 5 through Cell 40. Lines from the cells pass through the concrete and terminate in connector nozzles in the trench. Moisture, which may enter the trench from the canyon deck or from piping leaks in the trench itself, drains to the cell drain header via 6 inch (.15 m) drain laterals. An Amercoat coating was applied to the surface of the pipe trench as a part of the 1960s refurbishment.

<u>24" Cell drain header</u> - The cell drain header is constructed of 24 inch (.60 m) diameter vitrified clay pipe encased in reinforced concrete, with the joints caulked with a substance thought to have a bituminous base. The drain header was constructed as an integral part of the building.

<u>Cell 10</u> - Cell 10, 24 feet 8 inches (7.51 m) long, and 13 feet (3.96 m) wide is located 20 feet (6.09 m) lower than the standard canyon cells. The construction of the walls and floor is reinforced concrete, 6 feet (1.82 m) thick. A small sump, 1 foot (.30 m) wide, 2 1/2 feet (.76 m) long, and 1 1/2 feet (.45 m) deep, is located along the east wall. This sump provides tertiary containment.

<u>Tk 10-1</u> - This tank was constructed in accordance with Detail 61881, dated 10-25-1943. The tank, 11 feet (3.35 m) wide x 18 feet (5.48 m) long x 7 feet (2.13 m) deep, is fabricated of 3/8" (9.50 E-3 m) thick welded plate, with no post weld heat treatment. The material is 25-12Cb in accordance with DuPont Specification No. 820-R-1, Grade 820-B, which is close to the specifications for a type 309 stainless steel. The design capacity is approximately 10,000 gallons (37.85 m^3) of water.

6" Drain Risers - The 6" drain risers are vitrified clay pipe encased in reinforced concrete.

4.3 DANGEROUS WASTE CHARACTERISTICS

Letter #16500-94-011-JWG, JW Gehrke to SE Killoy, dated February 2, 1994, provides a brief process history of the plant and provides an indication of low-level waste system chemical exposure. A review of this process history, which lacks specific waste chemistry, shows the potential for the waste having significantly corrosive properties. Since the plant is no longer in the process mode, the corrosive potential and the radiation level of the waste has significantly diminished.

Tank samples are routinely analyzed so the waste can be treated to maintain the chemistry within specified parameters. Before each transfer of the waste to the tank farms the liquid waste is sampled and analyzed for acceptability to WHC-SD-WM-OCD-015, Tank Farm Waste Transfer Compatibility Program and WHC-SD-WM-EV-053, Double-Shell Tank Analysis Plan. Percentage solids is one of the characteristics checked, if the solids are greater than 4% of the waste the transfer is followed by flush water to prevent the solids from accumulating and plugging the piping. Attachment A contains typical examples of the results of analyses performed over the past several years. The waste will continue to be mostly water with small amounts of radioactive isotopes, sodium hydroxide, nitrates, nitrites and other constituents. Analysis for the content of each element is not performed. The typical analysis results in Attachment A are from samples taken from Tk 25-1 or Tk 25-2 as these are typical of today's waste because prior to 1995 the waste transfers to the tank farm were made from these tanks.

Four characteristic definitions in WAC 173-303-090 are used to determine dangerous waste. A comparison of the four characteristic definitions with the results of the analyses indicates the waste characteristics as follows:

Ignitible - The waste is non-ignitible

Corrosive - The waste is corrosive and there is a potential for Cl^- cracking corrosion, generally transgranular, of the stainless steel pressure boundary material due to the presence of Cl^- and possibly other halogens in the waste. Sodium hydroxide is added to the waste in the tanks to raise the OH^- concentration to at least 0.01 molar concentration, which is essentially a minimum pH of 12. Sodium nitrite is added to raise the nitrite above 0.011 molar concentration to reduce precipitation. The high pH waste is compatible with the concrete.

Reactive - The waste is non-reactive

Toxic - The waste is toxic.

Documents WHC-SD-WM-OCD-015, and WHC-SD-WM-EV-053, provide the requirements that maintain waste chemistry that is compatible with the materials in the waste system. The analyses, examples of which are found in

Attachment A, provide the verification of compliance to the compatibility requirements.

4.4 EXISTING CORROSION PROTECTION MEASURES

The external corrosion protection of the low level waste system is provided by the weather enclosure provided by the building and the ventilation system that controls the environment. The internal corrosion protection of the system is provided by the selection of the materials, fabrication methods, process fluid chemistry limits, and control of the operating parameters. Routine analysis required by operating procedure, BO-018-035, Transfer Wastes from Tk 25-2 to Underground Storage, limit the percent solids and the concentration of H^+ or OH^- ions and measure chloride (since 1990), radioactivity levels and other waste characteristics as shown in the examples of analysis results in Attachment A. The transfer temperature of the tank waste is required to be 50 °C or lower. Analysis records show that the radiation of the waste is normally less than 1 Roentgen/hour. Degradation of the system materials from this rate of radiation should be negligible.

Material

The original material selected for the tanks, exposed to process fluid, was type 347 stainless steel. Type 304L stainless steel material was used to modify the tanks in the 1960s for their new mission. The gasket material used in the recent past, and currently, is Teflon[2]. Generally, the support material is carbon steel that is protected from corrosion by a coating material.

Corrosion Allowance

A review of the design documentation found no explicit corrosion allowance for either the original piping system or for changes to the piping or tank systems. However, schedule 40 piping was used where schedule 10 would have been structurally adequate and the minimum tank wall thickness is 1/4 inches (6.35 E-03 m) where 10 gauge (3.42 E-02 m) would have been adequate for hydraulic containment, therefore, a generous corrosion allowance is implicitly included.

Cathodic Protection

No requirements for cathodic protection were found in the design documentation. There are no metal components in contact with the soil.

4.5 AGE OF THE WASTE TANK SYSTEM

The 221-B building is about 50 years of age, therefore, the secondary containment portion of the low level waste system, other than those noted refurbished areas, are about 50 years of age. The age of the piping in the waste tank system is approximately 30 years or less. Tk 24-1 and Tk 25-2 were originally constructed for use in U Plant in about 1950. In the mid-1960s

[2]Teflon is a product of the Du Pont de Nemours Company.

these tanks were refurbished and installed in the B Plant low level waste system. The surfaces of the hot pipe trench, cell 24 and 25 were also refurbished in the mid-1960s. The balance of the piping and other ancillary equipment comprising the waste tank system was also installed as part of Project CAC-144 and is 30 years of age or less.

This facility and system are of similar age as other facilities at Hanford that remain functional, as needed. The findings reported in WHC-SD-CP-ER-041, Plutonium Finishing Plant Aqueous Waste Tank System Integrity Assessment Report, provide an example of stainless steel piping and tanks that continue to function satisfactorily after over 40 years of similar service. The wall thickness of the piping and tanks in this system were measured ultrasonically to determine loss of material. The exceptions are those portions of facilities or systems which were operated outside the original design parameters.

No requirements for fatigue strength have been found, but, fatigue should not be a material integrity factor for the following reasons. The minimum endurance limit for the type 300 series stainless steels is 30 kip/in^2 (206 E+06 Pa) or greater (Marks', 6th ed., 6-43). If the material's endurance limit is not exceeded, the material's endurance to stress cycles approaches infinity. With the system operating pressure being less than 100 lb_f/in^2 (689 E+03 Pa) and the operating temperature being well below 200 °F (93 °C) and above 50 °F (10 °C) the frequency of exceeding the endurance limit is expected to be low.

4.6 INTEGRITY EXAMINATIONS

The integrity examinations to identify degradation and the extent of degradation to the low level waste system were performed as separate activities. These activities, which may differ somewhat from those required by the IAP, are: 1) visual examination of the hot pipe trench, cell 24, cell 25, and the cell drain header; 2) visual examination and a review of the design to determine if piping would withstand seismic effects without failure; 3) review of the Tk 24-1 seismic analysis, the Tk 25-2 design, and tank utilization to determine whether seismic analysis was warranted for Tk 25-2; and 4) leak test of Tk 24-1, Tk 25-2 and the transfer piping.

The cooling coils are no longer in use and were not leak tested. The internal visual examination of an original (1940s) pipe section could not be completed because of sediment, but this pipe, as with all pre-1960s piping, is no longer used.

4.6.1 Visual Examination

All visual examinations were performed using a remotely controlled closed circuit television (CCTV) camera. Direct personnel access was not practical due to the radiation levels and physical accessibility into the cells or hot pipe trench. Procedures WP-B-95-035, Video Examination of TK-24-1 and the Hot Pipe Trench Sections 23/24 and 31/32, and WP-B-95-038, Video Examination of Cell 25 and TK 25-2 were prepared for the performance of the visual examination of the noted areas and leak testing of Tk 24-1 and Tk 25-2. These procedures were also used for performance of the leak testing. All CCTV visual examination video tapes are available at the B Plant facility for record and future reference.

Hot Pipe Trench - On September 1, 1995, the hot pipe trench cover blocks at cell 23/24 and cell 31/32 jumper stations were removed to perform a visual examination of these sections of the hot pipe trench using remotely operated CCTV. The visual examination of this portion of the hot pipe trench is considered representative of the remaining portion of the trench. The removal of additional coverblocks exposes personnel and equipment to potential dangers not considered consistent with the As Low As Reasonably Achievable (ALARA) policy, which requires minimizing activities that expose equipment or personnel to situations where adverse consequences may occur.

In the cell 23/24 section of the hot pipe trench, an accumulation of sediment, perhaps an inch or so thick, was observed on the floor in a local area. Reportedly, a frothy substance was bled from the line during fill and bleeding in preparation for leak testing of waste transfer line V-244. The coating on the hot pipe trench floor and the piping support anchor bolts at the floor elevation show evidence of degradation. But in neither of these areas is the degradation considered serious. The coating remains on the walls for the most part, with random coating cracks not considered significant. The floor and walls were dry.

In the cell 31/32 section of the hot pipe trench the hot pipe trench floor coating is degraded, but, the floor appears in good condition. There is some equipment and a small amount of debris on the floor. The coating on the walls is cracked but mainly intact. Piping supports at the floor elevation are rusted, but, not significantly. Though the floor and walls were dry there was evidence of a corrosive atmosphere in both areas in the trench in the past. Evidence of this condition is the partial degradation of the carbon steel pipe support structure coating. These degraded coating areas have a superficial layer of rust. It appears the coating on the floor and lower portion of the piping supports is up to 90% degraded and the coating on the walls is about 10% degraded. The degradation of the coating has not significantly affected the structural capability of the piping supports or the function of the floor and walls as secondary containment.

The degradation of the coating on the floor and the piping supports mentioned above is thought to be related to periods in the past when the facility was in a vigorous process mode. The facility is now in transition to decommissioning status and the corrosive characteristics of the relatively low volume of waste being transferred are compatible with the secondary containment. See analyses in Attachment A for examples of waste chemistry.

An additional examination was performed in this area to resolve a question regarding piping size and material. Drawing H-2-61034, Piping Plans Hot Pipe Trench Cells 31 & 32, identified a section of the waste transfer piping immediately upstream of nozzle 31/32-8 to be 1" carbon steel. All other design documentation describe this line to be 2" stainless steel. To resolve this inconsistency, during the week of August 20, 1995, the section of piping was examined using CCTV. The examination video tape clearly shows this section of piping to be 2" stainless steel, as is the other piping in this area of the trench. No significant degradation of the piping or the supports was observed.

Cell 24 and Tk 24-1 - On September 1, 1995, the cover blocks were removed from cell 24 to perform a visual examination of the cell and Tk 24-1 using a remotely controlled CCTV. The objective of the visual examination was to examine the cell and the tank for evidence of leakage or degradation.

Most of the coating on the floor was gone, no cracks were noticed, but, in some areas there appeared to have been erosion of the cement between the aggregate to approximately 1" (2.54 E-02 m) depth. Perhaps liquid waste has chemically eroded the binding cement. Several pieces of hardware were scattered about. The trunnions and trunnion guide hardware are mostly carbon steel and have degraded, especially the anchor bolts and plates adjacent to the floor. The significance of the floor erosion does not seriously impede the function of the cell as secondary containment. The concrete floor, which remains sloped to the drain, is 6 feet (1.82 m) thick.

During the refurbishment of the 1960s the lower 2 feet (.60 m) of the walls received a more rigorous repair than the walls above this level. The condition of the walls above and below this level appears very similar at this time. Some cracking appears more than superficial, but the extent of these cracks is uncertain. There are a number of ~14" (.35 m) diameter holes, several feet above the floor, core drilled through the wall between the cell and the ventilation plenum, which runs parallel to the cells. No cracks were observed in the cross-section surface, exposed by the core drilling. Some degradation of the concrete surfaces and the trunnion hardware is evident, but it is not thought to be serious. No cracking of the floor was observed.

As noted earlier, the degradation of the floor and other areas is a result of past practices and does not represent the effects of the existing system. The liquid waste being collected and transferred is not aggressively corrosive to concrete should it be spilled in a cell or elsewhere in the secondary containment.

The camera was able to view a portion of the underside of the tank. The visible portions of the tank, shimmed supports, bottom and side walls appeared in good condition. Stains on the outer shell of the tank were the result of excess lubricants or process liquid spillage. No significant evidence of degradation of the tank was observed.

Cell 25 and Tk 25-2 - On September 8, 1995, the cover blocks were removed from cell 25 to perform a visual examination of the cell and tank 25-2 using remotely controlled CCTV. The objective of the visual examination was to examine the cell and the tank for evidence of leakage or degradation.

The findings of this visual examination were very similar to those found when examining cell 24. The floor had an accumulation of precipitate in one area and in a couple other areas there was erosion of the cement between the aggregate. These areas indicate an attack on the cement, most likely by liquid waste spillage during leak testing or jumper and equipment change-out.

The walls had cracking, but, the extent of this cracking could not be determined. The trunnions, and trunnion guides had lost most of the protective coating and are beginning to show significant corrosion, especially, some of the anchor bolts and plates adjacent to the floor. The consequence of the corrosion is insignificant because the trunnion assemblies no longer serve a functional purpose.

The supports and visible portions of the tank appeared to be in good condition. There were some stains along the side of the tank extending beneath the tank, but, these are thought the result of excessive lubricant.

Generally, nothing was found to indicate that this portion of the system had degraded to the point of not being adequately functional.

24" Cell Drain Header - In late 1989 and early 1990, a visual examination of the cell drain header was performed using a crawler vehicle and CCTV. The video tapes were reviewed in late September 1995 to examine the drain header for evidence of degradation or leakage. The invert of the drain header was found containing a couple inches (.05 m), more or less, of a mixture of liquid, sediment, and an occasional deposit of saltcake appearing substance, which retained a pool of liquid and sediment upstream. The crawler broke up these pools, so, on the return trip the stream was more uniform. At several locations beside the stream were additional deposits of the saltcake appearing substance. The sections of vitrified clay appeared in good condition, there was no noticeable evidence of erosion, cracking or discontinuity from section to section. The focus and resolution of the camera was not adequate to determine the condition of the caulking at the joints. At many of the joints the saltcake appearing substance extended circumferentially further than between the joints. Presumably, the caulking acts similar to a wick, raising the liquid moisture which evaporates to leave a salt residue. There was no evidence of leakage from the cell drain header.

The trickling stream of water in the cell drain header, as observed in 1989, was not an indication of leakage from cell 24 or 25 because the header also collects drainage from the other 30 cells between cell 10 and cell 40. The source of the water in the header was the result of activities in cells other than cell 24 or 25. Operating records indicate no increase in Tk 10-1 inventory from the cell drain header during the past several months.

The radiation reported during the examination varied from 100 to 2700 Roentgens/hour (approximate values). The temperature in the drain header, recorded on the crawler, was in the 60s °F (16 to 20 °C).

4.6.2 Leak Tests

Four separate leak tests were performed to check the leak tight integrity of the low level waste system. Following are brief descriptions and results of these leak tests.

Transfer Line - On March 9, 1995, the transfer line, V-244, between diversion box 241-ER-152 and the 23/24-10 nozzle adjacent to cell 24, including jumpers 31/32-8 to 31/32-10 and 39/40 to line 244 nozzle, were leak tested in accordance with Document No. TO-140-170, Rev.E-2, dated 11/7/94, and Document No. 2E-94-00951/0. The leak test found the transfer line acceptable for continued use.

Tk 24-1 - On September 1, 1995, a baseline visual examination as described above was performed to establish the condition of the cell floor and the exterior surface of the tank. Later that day, Tk 24-1 was filled with a minimum 7,500 gallons (28.39 m^3) of waste water. The liquid level and temperature of the tank was monitored for the next two days and this data was recorded on page 10 Procedure No. WP-B-95-035. On September 8, 1995, a final

CCTV visual examination of the cell floor and the exterior surface was made to identify any leakage from the tank that may have occurred. No evidence of leakage on the cell floor or the exterior surface of the tank was observed.

Transfer Line - An in-service leak test of the transfer piping from Tk 24-1 to the 23/24 nozzle in the hot pipe trench was conducted on September 8, 1995. The flexible portion of the jumper immediately upstream of the 23/24 nozzle connector appeared to be enlarged, possibly due to mishandling. The jumper is fabricated from corrugated ductile stainless steel material, which should continue to function acceptably. The braid appeared in good condition. No evidence of leakage from this piping during the transfer was observed. Observance was via CCTV.

Tk 25-2 - On September 8, 1995, a baseline visual examination as described above was performed to establish the condition of the cell floor and the exterior surface of the tank. The tank was filled to approximately 2900 gallons (10.9 m^3) of waste water and liquid level and temperature monitoring began on 10/6/95 and continued until 10/10/95. These data were recorded on page 8 of Procedure No. WP-B-95-38. On October 10, 1995, a final CCTV visual examination of the cell floor and the exterior surface was made to identify any leakage from the tank that may have occurred. No evidence of leakage on the cell floor, around the drain, or on the exterior surface of the tank was observed.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions drawn from evaluating the system design, waste characteristics, corrosion protection measures, and age. Also included is a study of the results of examinations, tests and past performance of the system to assess the corrosive degradation of the material.

5.1 DESIGN STANDARDS

The design codes and standards listed in section 4.0 for the low level waste system are generally adequate for the intended function of transferring liquid waste at pressures below 100 lb_f/in^2 (689 E+03 Pa) and temperatures well below 200 °F (93 °C). Projects CAC-144 and CAC-181, which refurbished a majority of the system, used updated materials, fabrication requirements and installation techniques that maintained the design integrity. The years of acceptable service, the limited operating temperature range, the piping layout, and piping material lead to the conclusion that any thermal analysis of the existing system would not be meaningful. Design observations, and comments are as follows:

1. The secondary containment design configuration for waste tanks Tk 24-1 and Tk 25-2 does not fit the description found in section 173-30-640(4)(d) of the WAC. The design configuration fits neither the "liner", "vault", or "double-walled tank" concept, as described in this section. Of the three concepts, this secondary containment is most like the vault configuration. Aspects of the design, other than configuration, appear to meet the WAC functional criteria for these concepts, which is to have the capacity to contain waste

leakage and prevent migration of waste leakage to the environment. This secondary containment has one hundred percent capacity of the Tk 24-1 contents (with administrative limits), transite is used as a water stop at construction joints, Tk 10-1 provides an impermeable boundary to prevent migration of waste, and the ventilation system protects against vapor ignition,. The vault is not subject to hydraulic pressure, therefore, an exterior moisture barrier is not required.

2. The secondary containment surface coating on the floors of the cells and the hot pipe trench have not resisted degradation, presumably, from spillage of the liquid waste. The examinations show the floor coating mostly gone and some degrading of the wall coating. Past practices are responsible for the degradation. Presently, the waste is compatible with the secondary containment materials and the cells appear capable of providing the secondary containment function acceptably in the foreseeable future.

3. The trunnion assembly coating in the cells and the piping support coating in the hot pipe trench have not resisted degradation by the liquid waste spillage. The trunnion assemblies provide no structural support. They only serve the purpose of correctly locating the tank during installation. The examinations show the trench floor coating to be degraded and the piping support coating, especially near trench floor elevation, to be degraded. These findings of degradation are the result of past practices. The coating degradation observed does not affect the function of the trench as secondary containment. Concrete degradation was not evident. The coating degradation and superficial rust observed does not significantly affect the structural integrity of the piping support structures.

4. The vitrified clay pipe caulking in the 24" cell drain header may not have resisted degradation by the liquid waste. On the other hand, there is no evidence of degradation of the caulking. The vitrified clay pipe material is, perhaps, the best material that could have been selected for this application because of the wide range of chemicals with which it is compatible.

5. The seismic analysis indicates a potential of Tk 24-1 tank wall failure during a seismic event. In view of the following, continued service is considered acceptable for this tank: 1) A seismic event is unlikely during the remaining few years of service for this tank; the facility is scheduled to close in 1998; 2) The characteristics of the liquid waste being handled are benign; 3) Replacement or modification of the existing tank would generate additional waste, expose personnel to hazardous conditions, and add significant cost; and 4) The consequences of this benign waste spilling onto the secondary containment, should a seismically initiated tank failure occur, would not be catastrophic because the waste would be contained.

As noted above, the system as designed is fit for service.

5.2 WASTE CHARACTERISTICS

Based upon the ignitability, corrosivity, reactivity, and toxicity characteristics of the waste as defined in WAC 173-303-090, the waste was determined not to be ignitable or reactive, but was determined to be corrosive and toxic. The corrosiveness of the liquid waste to the primary containment is controlled by the use of additives and the toxicity is controlled by features in the design and operating procedures, which prevent the environment from being affected. The corrosiveness of the liquid waste spillage to the portions of the secondary containment and support hardware is discussed in paragraph 5.1 and elsewhere herein.

The characteristics of the liquid waste being handled by the system and the system design are considered to be adequately compatible.

5.3 CORROSION PROTECTION

Corrosion protection measures were included in the original design and have been continued during the system upgrades. The carbon steel material used to construct the trunnion assemblies, which maintain the tanks in proper position, has begun to corrode. The use of ASTM identified materials, or materials within specified chemical limits, qualified welders and welding procedures, and inspection of the welds should have resulted in a level of integrity of the primary liquid waste containment design suitable for the intended service. With some exceptions, the materials selected for fabricating the system are appropriate for the intended service. The exceptions are the coating on the carbon steel materials and the coating on the concrete that has degraded. A significant portion of this degradation is thought to have been caused by past practices, which are no longer in effect.

The ventilation system appears to supply a generous flow of air through the cells, thereby, minimizing corrosion by keeping the cells and the system dry. Cathodic protection is not considered to be an important factor in controlling the corrosion rate of the waste tank system.

The design and operational practices provide the needed corrosion protection for the system.

5.4 AGE AND OTHER

Age does not appear to be a significant degradation factor for the tanks and piping. Wall thickness measurements of piping and tanks of similar age fabricated of similar material, exposed to similar operating conditions in other waste systems at Hanford support this conclusion. As noted elsewhere herein, there has been some degradation of the secondary containment materials, but, this degradation is not considered to be serious. The drain risers, cell drain header and Tk 10-1, which comprise the remaining portion of the secondary containment, are approximately 50 years of age. The review of the visual examination of cell drain header found no leakage or noticeable evidence of degradation of the vitrified clay pipe.

System degradation due to fatigue is not expected to be significant, because the operational stress and the stress cycles are low.

Age is not considered a limiting factor in the performance of the system in the foreseeable future.

5.5 MATERIAL CONDITIONS

Tk 24-1 and Tk 25-2 - The leak testing and the visual examination of the liquid waste tanks indicates the material condition of these tanks to be acceptable.

Ancillary equipment - The leak testing and the visual examination of the piping and other ancillary equipment indicates the material condition of this equipment to be acceptable.

Secondary containment - The visual examinations have shown the protective coating on the concrete surfaces of the secondary containment in some areas has undergone degradation, presumably, due to spillage of the liquid waste and/or chemical additives. The visual examination shows that the floor surface of the cells and the hot pipe trench coating degradation to be near complete. In some areas in the cell, there appeared to be an attack on the concrete floor. The walls of the cells and the hot pipe trench, to a lesser extent, show cracking, but, the coating is mainly intact. The visual examinations do not show that these portions of the secondary containment have been compromised such that they would allow migration of wastes or accumulated liquid out of the system to the soil, ground water, or surface water at any time during the use of this tank system.

The visual examination of the cell drain header found no indication of material defect or material degradation.

The examinations and tests conclude that the condition of the materials is acceptable for performing the system functions.

NOTE: Daily monitoring will be continued until tanks are deactivated as part of the B Plant Facility transition to shutdown. Shutdown is scheduled to be completed by FY 1998.

6.0 REFERENCES

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ASTM, *American Society for Testing and Materials*, Philadelphia, Pennsylvania.

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WHC, *Transfer Waste From Tk 25-2 to Underground Storage*, Procedure BO-018-035, Westinghouse Hanford Company, Richland, Washington.

Surface Preparation Specifications, SSPC-SP5-52T, Steel Structures Painting Council, Pittsburgh, Pennsylvania.

APPENDIX A
B PLANT LOW LEVEL WASTE SYSTEM
INTEGRITY ASSESSMENT REPORT

Table 1. B Plant Low Level Waste System Specification List

Specification No.	Title	Remarks
HW-4311	General specification for material procurement and shop fabrication of Class I, II & III Vessels	
HS-BS-0084	Jumper fabrication	Supersedes HWS-5786
HS-V-S-0030	Testing of vertical turbine and submersible pumps	Supersedes HWS-10279
820-R-1	Heat treatment and material specification for wrought 18-9-S-Cb and 25-12-S-Cb	

Table 2. B Plant Low Level Waste System Drawing List

Drawing No.	Title	Remarks
H-9-1069	Pump vertical turbine stainless steel	
SK-2-19686	Cell 24 arrangement one line diagram	
SK-2-19702	Phase III drawing index	
SK-2-19871	Hot pipe trench & cell schematic cells 21-24	
H-2-32446	Details-alloy steel male connector nozzle 1"-4"	
H-2-32585	Protective coating cells 5, 13, 14 thru 40, hot pipe trench.	
H-2-33073	Compression gauge ring gasket Hanford type conn.	
H-2-33099	Typical cross section	
H-2-34217	Arrangement HPE sparing systems cells 21-28	
H-2-34672	Pump assembly for corrosive service	
H-2-35324	Composite flow diagram cell 24 TK-24-1	
H-2-35341 (2 shts)	Header systems in hot pipe trench	
H-2-36130 (3 shts)	B Plant drawing list essential, support, general	
H-2-40488	Class I vessel 10'-0" x 16'-0" x 14'-0" oval tank	
H-2-40923	Chemical equipment - detail of lifting bails	
H-2-40977	Chemical equipment - detail of vessel flanges	
H-2-44841	Drawing index (CAC-981)	
H-2-57901	Flexible metal hose mode and assy	
H-2-60300 (2 shts)	Drawing index (CAC-144)	
H-2-60336	Cell modification trunnion guide relocation	
H-2-60340	Drawing index (CAC-181)	

Drawing No.	Title	Remarks
H-2-60825	Engineer flow diagram hot pipe trench cell 33, 34, 35 & 36	
H-2-60885	Cell 24 in-cell piping arrangement	
H-2-60896	In-Cell piping support details	
H-2-60924	Cell #24 cell arrangement	
H-2-60962	Pump arrangements & schedule	
H-2-61026	Piping plans hot pipe trench cells 23 & 24	
H-2-61028	Piping plans hot pipe trench cells 25 & 26	
H-2-61029	Piping sections hot pipe trench cells 25 & 26	
H-2-61030	Piping plans hot pipe trench cells 27 & 28	
H-2-61031	Piping sections hot pipe trench cells 27 & 28	
H-2-61032	Piping plans hot pipe trench cells 29 & 30	
H-2-61033	Piping sections hot pipe trench cells 29 & 30	
H-2-61034	Piping plans hot pipe trench cells 31 & 32	
H-2-61035	Piping sections hot pipe trench cells 31 & 32	
H-2-61036	Piping plans hot pipe trench cells 33 & 34	
H-2-61037	Piping sections hot pipe trench cells 33 & 34	
H-2-61038	Pipe support hot pipe trench cells 17-34	
H-2-61039	Supports-steel details hot pipe trench cells 17-40	
H-2-61040	Hot pipe trench anchors, guides & details	
H-2-61041	Jumper assembly 12-39 hot pipe trench	

Drawing No.	Title	Remarks
H-2-61042	Piping plans hot pipe trench cells 35 & 36	
H-2-61043	Piping sections hot pipe trench cells 35 & 36	
H-2-61044	Pipe supports hot pipe trench cells 34-40	
H-2-61045	Piping plans hot pipe trench cells 37 & 38	
H-2-61046	Piping sections hot pipe trench cells 37 & 38	
H-2-61047	Piping plans hot pipe trench cells 39 & 40	
H-2-61048	Piping sections hot pipe trench cells 39 & 40	
H-2-92573	Composite assemblies vertical turbine pumps	
HW-69880	Standard section (supports & guide arrangement) plans & sections	
HW-69881	Standard section (supports & guide arrangement) sections	
HW-69882	Piping thru concrete - standard section plans	
HW-69883	Piping thru concrete - standard sections	
HW-70101	Piping thru concrete - sections 3 & 4	Cell & piping trench cross-section
HW-70103	Piping thru concrete - section 15	Cell & piping trench cross-section
HW-70426	Steel framing braces	
Detail 61516	Proj. 9536	Outfall & vent pipe
Detail 61881	Proj. 9536	Tk 10-1

ATTACHMENT A

B PLANT LOW LEVEL WASTE ANALYSES

SAMPLE POINT 25-2 ROUTINE ANALYSIS

Serial Number	Date	Set % Sol.	Vis	OTR	90 Sr	137 Cs	OH	pH	NO_2	NO_3	TOC	Na	Cl
	Time			Units	Units	Units	Units	Units	Units	Units	Units	Units	Units
7322	9/25/92	<2%	YELLOW CLEAR	50	5.148^{+3}	9.76^{+3}	$<3.85^{-2}$		1.64^{-2}	$<4.79^{-4}$	$<5.50^{-2}$	1.62^{+2}	7.41^{-4}
	1046			MRAD	uCi/gal	uCi/GAL	M		M	M	G/LC	PPB	M
Comments:			DSC	Ba	Cd	Cr	Pb	Ag	As	Hg	Se	Total Pu	~~Fe~~ TOTAL PU - BERLIN
				Units	Units	Units	Units	Units	Units	Units	Units	Units	Units
			NO EXOTHERMS	1.617^{+3}	$<1.47^{+2}$	$<2.52^{+2}$	$<1.49^{+3}$	3.02^{+2}	3.57^{-2}	$<2.00^{-2}$	2.91^{+1}	2.65^{-7}	$<9.97^{-7}$
				PPB	PPB	PPB	PPB	PPB	mG/L	mG/L	uG/L	G/L	G/L

ATT-A2

SAMPLE POINT 25-2 ROUTINE ANALYSIS

Serial Number	Date	Set % Sol.	Vis	OTR	90 Sr	137 Cs	OH	~~pH~~ OH^-	NO_2	NO_3	TOC	Na	Cl
	Time			Units	Units	Units	Units	Units	Units	Units	Units	Units	Units
7333	10-7-92	<2.8	cloudy LT yellow no organics	8.5 E8	3.936^{+3}	9.198^{+3}	2.72^{-2}	2.72^{-2}	2.16^{-2}	$<4.79^{-4}$	8.2^{-2}	1.67^{+6}	4.22^{-4}
				MRADS	uCi/gal	uCi/gal	M	M	M	M	G/LC	PPB	M
Comments:			DSC	Ba	Cd	Cr	Pb	Ag	As	Hg	Se	Total Pu	Fe
Pu out of Range - Low				Units	Units	Units	Units	Units	Units	Units	Units	Units	Units
			NO EXOTHERMS	$<1.23^{+2}$	$<2.87^{+2}$	$<4.92^{+2}$	3.83^{+3}	4.10^{+2}		$<2.00^{-2}$		1.75^{-7}	
				PPB	PPB	PPB	PPB	PPB		mG/L		G/L	

WHC-SD-WM-ER-456
Rev. 0

TK 25-1

ATT-A3

SAMPLE POINT 25-1 ROUTINE ANALYSIS

Serial Number	Date / Time	Set % Sol.	Vis	OTR (Units)	90 Sr (Units)	137 Cs (Units)	OH^- (Units)	pH (Units)	NO_2 (Units)	NO_3 (Units)	TOC (Units)	Na (Units)	Cl (Units)
B7808	5.22.93	<2.00% By Vol	Pale yellow NO ORG FEW solids	2500 ~~300~~ c.o	1.39^{+5}	3.45^{+7}	2.00^{-1}	12.80 ~~1.28~~	5.06^{-2}	4.05^{-2}	1.54^{-1}	9.38^{+6}	2.34^{-3}
				mR	uci/L	uci/gal	M		M	M	G/LC	PPB	M

Comments:	DSC	Ba (Units)	Cd (Units)	Cr (Units)	Pb (Units)	Ag (Units)	As (Units)	Hg (Units)	Se (Units)	Total Pu (Units)	Fe (Units)
AT 2.70^{+3}		$<3.03^{+2}$	$<6.06^{+2}$	1.68^{+4}	7.65^{+3}	6.36^{+2}	9.01^{-1}			$<3.15^{-4}$ ~~2.70^{+2}~~	
		PPB	PPB	PPB	PPB	PPB	Mg/L			G/L	

SAMPLE POINT 25-1 ROUTINE ANALYSIS

Serial Number	Date / Time	Set % Sol.	Vis	OTR (Units)	90 Sr (Units)	137 Cs (Units)	OH^- (Units)	pH (Units)	NO_2 (Units)	NO_3 (Units)	TOC (Units)	Na (Units)	Cl (Units)
B7810	5.26.93	<2.00% By Vol	LT. YELLOW CLOUDY Solids PRESENT	44,100, 120	1.45^{+4}	8.66^{+6}	1.64^{-1}	1.29^{+1}	5.23^{-2}	1.43^{-3}	3.3^{-1}	5.21^{+6}	1.78^{-3}
	0215			mRAD/HR	uCi/Gal	uCi/gal	M	12.9	M	M	G/LC	PPB	M

Comments:	DSC	Ba (Units)	Cd (Units)	Cr (Units)	Pb (Units)	Ag (Units)	As (Units)	Hg (Units)	Se (Units)	Total Pu (Units)	Fe (Units)
AT 9.950^{+2} uCi/L	NO EXOTHERMS	$<3.03^{+2}$	$<6.06^{+2}$	$<9.09^{+2}$	$<6.26^{+3}$	$<5.05^{+2}$				2.25^{-5}	
		PPB	PPB	PPB	PPB	PPB				G/L	

SAMPLE POINT 25-2 1991 Date From To

ROUTINE ANALYSES

SPECIAL REQUEST

SERIAL NO.	DATE TIME	SET SOL. %	VIS	OTR UNITS	90 Sr UNITS	137 Cs UNITS	~~134 Cs~~ DSC UNITS	NO_3 UNITS	~~CO_3~~ CL UNITS	TOC UNITS	Na UNITS	NO_2	OH^-
4994	5-4-91 0830	<5.26	<1% OL NO organic	3mrad/HR 24 mrad/HR	2.18^{+3} uci/gal	4.088^{03} uci/gal		$<5.7^{-3}$ m	$<1.16^{-3}$ m	6.77^{-2} gm/lc	6.98^{-2} m	2.35^{-2} M	4.74 M
5000	5-6-91 1645	<5.71		3 M Rad/Hr									
5009	5-10-91	<2.5 1.25 NONE	Cloudy Colorless	3 MRad/HR 15 MRad/HR 40 MRad/HR	1.93^{+3} uci/GAL	4.16^{+3} uci/gal		$<5.7^{-3}$ M	2.5^{-3} m	1.26^{-1} gm/LC	4.63^{-2} M	3.03^{-2} M	3.61 M
5024	5-17-91 0100	<3.08	colorless NO org. <100 LAMDA Sol.	6+8+2 MR	7.46^{+3} uci/GAL	4.54^{-3} uci/GAL		$<5.7^{-3}$ m	2.42^{-3} M	5.5^{-2} GM/LC	1.09^{-1} M	1.18^{-2} M	5.97^{-2} M
5041	5-24-91 0900	<1.67% solids SET	COLORLESS NO ORG. <100 LAMB SOLIDS	1.5 MRAD 3 MRAD	 uci/gal	4.845^{+3} uci/gal		$<5.7^{-3}$ m	3.49^{-3} m	$<5.5^{-2}$ GM/LC	1.33^{-1} m	3.28^{-2} M	6.41 M
5041	5-24-91 0900	<1.67% SET SOLID	COLORLESS NO ORG. <100 LAMB-SOLID	1.5 MRAD 3 M/RAD	2.42^{3} uci/GAL	4.845^{3} uci/L	AL 8.98 PPM	FE 1.28 PPM	3.49^{-3} M	-5.5^{-2} GM/LC	1.33^{-1} M	3.28^{-2} M	6.42 M
5067	6-10-91 —	<2.08	Aqueous Solid Cloudy Colorless	10 MRAD	1.862^{+3} uci/GAL	3.278^{+3} uci/GAL		$<5.53^{-3}$ M		$<5.5^{-2}$ GM/LC		2.59^{-2} M	4.21 M
5080	6-15-91 0530	4.08	AQUEOUS CLEAR OPAQUE		4.769^{+3} uci/GAL	3.085^{+3} uci/GAL		8.42^{-2} M	$<1.14^{-3}$ M	$<5.5^{-2}$ GM/LC	1.59^{-1} M	3.47^{-2} M	5.29 M
5093	6-24-91 1700	<1.82	AQUEOUS CLOUDY <1% SOLIDS	10 MRAD	2.033/04 uci/GAL	3.195/04 uci/GAL		2.98 M	8.48^{-3} M	2.64^{-1} GM/LC	4.02^{-1} M	4.06^{-2} M	2.00^{-1} M
5116	7-5-91 —	<2.22	yellow NO org <100L	20MR 2MR 2MR	2.00^{+3} uci/gal	2.54^{+4} uci/gal		3.52^{-2} M	$<1.14^{-3}$ M	9.79^{-1} GM/LC	2.65^{-1} M	5.02^{-2} M	1.28 M
5171	7-19-91 1800	42%	CLOUDY <1% SOLIDS	1.6 M/RAD	1.68^{+3} uci/gal	1.40^{+4} uci/gal		1.93^{-2} M	1.54^{-3} M	8.54^{-1} GM/LC	1.44 M	1.96^{-2} M	7.29 M
5237	7-29-91 1650	<1.92	Cloudy <1% Yellow	60 m/rad HR	1.10^{+3} uci/gal	1.354^{+4} uci/gal		6.41^{-3} m	3.3^{-3} m	5.13^{-1} gm/L	1.11-01 M	2.50^{-2} M	6.39 M

ATT-A4

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SAMPLE POINT 25-2

Date From 12-31-89 To 3-18-90

ROUTINE ANALYSES

SERIAL NO.	DATE / TIME	Set Solids (PH)	VIS	OTR UNITS	90 Sr UNITS	137 Cs UNITS	134 Cs UNITS	OH- UNITS	CO 60 UNITS	TOC UNITS	Na UNITS	SPECIAL REQUEST NO2	SPECIAL REQUEST NO3
2882	12-31-89 1735			1 MRAD 1 MRAD	1.51+3 uCi/gal	1.12 04 uCi/GAL		5.44-2 m		1.05-1 GM/LC	7.47-2 M	3.85-2 M	<4.04-3 m
2906	1-10-90 0030		Cloudy <1% sol no org.		8.48+2 uCi/gal	1.94+4 uCi/gal		5.46-2 m		1.11-1 GM/LC	9.28-2 M	2.65-2 m	<4.04-3 m
2927	1-17-90		CLOUDY <1% SOLIDS NO ORG.	<10MR/HR	1.10+3 uCi/GAL			8.53-2 M		8.78-2 GM/LC	1.23-1 M	1.91-2 M	4.16-3 M
2962	1-29-90 1800		Cloudy F.[illegible] No sol No org	<1 MRAD	7.72+2 uCi/gal	1.389+4 uCi/gal		4.13-2 M		6.60-3 GM/L	1.14-1 M	2.32-2 M	<1.06-3 M
2979	2-2-90 1700	<2.85	Cloudy No org <2.85% sol	3 MRAD	1.896+3 uCi/gal	1.23+4 uCi/gal		6.31-2 M		<5.5-2 GM/L	1.12-1 M	2.45-2 M	<4.16-3 M
3000	2-12-90 1745	<3.33	Clear no org <3.33% sol	4 M/RAD 3 M/RAD	1.81+3 uCi/gal	9.9+3 uCi/gal		7.74-2 m		1.40-1 / 5.80 [illegible] GM/L	1.08-1 M	2.17-2 M	<4.16-3 M
3020	2-18-90 0941	<2.96	Clear no org. <2% solids	5 MRad 1 MRad 4 MRad 5 MRad	1.56+2 uCi/gal	1.06+4 uCi/gal		9.39-2 M		<5.5-2 GM/LC	1.19-1 m	2.54-2 M	<1.06-3 M
3031	2-22-90 0140	12.86	Clear no org <2.86 Solids	3 MRAD/HR	1.02+3 uCi/Gal	8.49+3 uCi/gal		7.40-2 M		4.4-2 GM/LC	7.78-2 M	6.64-3 M	1.05-3 M
3048	3-1-90 0103	No Solids	Clear no organic 0% solids	2 MRad 2 MRad	2.40+3 uCi/gal	8.94+3 uCi/gal		7.31-2 / <4.92-3 M		3.15-3 GM/LC	1.22-1 M	3.18-2 M	<4.92-3 M
3070	3-8-90 1333	<3.08	Clear no org <3.08% sol	2 MRAD 2 MRAD	9.46+2 uCi/GAL	9.27+3 uCi/GAL		1.15-1 M		<5.50-2 GM/LC	1.54-1 M	1.59-2 M	<4.92-3 M
3086	3-15-90 2130	<2.86	<1.0 mRad Clear <2.86 Sol	<1.0 MRAD	1.28+3 uCi/gal	1.04+4 uCi/gal		1.04-1 M		<5.5-2 GM/LC	6.75-2 M	2.6-2 M	<4.92-3 M
3093	3-18-90 0113	<2.86	Clear no org <2.86% sol	2 mrad 2 mrad	1.257+3 uCi/GAL	1.55+4 uCi/gal		8.50-2 M		<5.50-2 GM/LC	1.34-1 M	3.37-2 m	2.47-3 m

ATT-A5

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ATTACHMENT B

LEAK TEST DATA SHEETS

TANK INTEGRITY DATA SHEET
(Page 1 of 1)

Approval To Exceed TK-24-1 OSD Volume Limit (Step 5.2[1])

Operations Manager: [signature] 9/1/95
Signature Date

Process Engineer: D.B. Kotsch 9-1-95
Signature Date

Tank 24-1 Volume Surveillance

(step 5.2[3]) Operator Name	(step 5.2[3]) Date	(step 5.2[3]) Time	(step 5.2[3]) Tank 24-1 Volume (gallons)	(step 5.2[3]) Tank 24-1 Temperature (°C)
K.O. Schmidt	9-1-95	1638	8462.3	19.34°
M.J Gwinn	9-2-95	0038	8466.0	19.54°
M.B. Hexum	9-2-95	0838	8479.3	19.74°
K.O. Schmidt	9-2-95	2300	8474.5	19.94°
M.J. Gwinn	9-3-95	0038	8408.0 *	20.0°
M.B. Hexum	9-3-95	0838	8491.5	20.3
K.O. [illegible]	9-3-95	1638	8481.	20.°

Validate Completion Of Data Sheet (step 5.2[4])

Shift Manager: [signature] 9-3-95
Signature Date

* Should be "8508.0". During verification following the test the transcribing error was discovered. This leak test data is retrievable from the instrumentation data record.

The indicated Δvol (45.3gal) during the leak test represents approx 1/2" liquid level change in the tank during the test.

EJ Walter
12-4-95

TK-25-2 LEAK TEST DATA SHEET

TANK INTEGRITY DATA SHEET
(Page 1 of 1)

Tank 25-2 Surveillance

(step 5.2[2]) Operator Name	(step 5.2[2]) Date	(step 5.2[2]) Time	(step 5.2[2]) Tank 25-2 Volume (gallons)	(step 5.2[2]) Tank 25-2 Temperature (°C)
C. Deboise	10/6/95	1415	2960.8	19.15
[illegible]	10/6/95	2200	2964.1	19.34°
[illegible]	10/7/95	0600	2971.2	19.64
C. DeBoise	10-7-95	1400	2969.6	19.74°
[illegible]	10-7-95	2200	2970.6	19.84
[illegible]	10-8-95	0600	2966.4	19.94
C. DeBoise	10-8-95	1358	2963.1	19.94°

Validate Completion Of Data Sheet (step 5.2[3])

Shift Manager: K.A. Burton (Signature) 10/8/95 (Date)

* WORKING COPY * Printed on: September 8, 1995

LINE V-244 LEAK TEST DATA SHEET

5.2 PRESSURE TESTING

5.2.1 REQUEST craft personnel START the pressure cycle AND SLOWLY BUILD UP pressure (less than approximately 60 psig/min) with the pump.

5.2.2 IF leaks are observed, perform the following:

5.2.2.1 BLEED OFF the pressure.

5.2.2.2 REQUEST craft personnel to tighten leaking fittings, flanges, or pressure test assembly connections as necessary.

5.2.2.3 WHEN identified leaks have been corrected, REPEAT steps 5.1.13 thru 5.1.15 as necessary to refill the transfer line.

5.2.2.4 PERFORM step 5.2.1 to build up pressure.

5.2.3 WHEN specified test pressure is reached, CLOSE the block valve to isolate the pump.

5.2.3.1 IF unable to maintain pressure, OBSERVE the transfer line or the encasement and any cleanout boxes (COB) associated with the transfer line for water leakage.

5.2.3.2 IF a leak is observed, NOTIFY PIC.

5.2.4 RECORD the starting time and pressure, THEN

(QC) RECORD the pressure at 10 minutes, 30 minutes, 40 minutes, 50 minutes, and at 1 hour in the PRESSURE TEST DATA table below:

*STOP WATCH

PRESSURE TEST DATA							
TIME	INITIAL	10 MIN.	30 MIN.	40 MIN.	50 MIN.	1 HOUR	QC INT.
* 00	155						KW 3-9-95
* 10 MIN		155					KW 3-9-95
* 30 MIN			154.9				KW 3-9-95
* 40 MIN				154.9			KW 3-9-95
* 50 MIN					154.8		KW 3-9-95
* 60 MIN						154.8	KW 3-9-95

ATT-B4

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	74750	Date 12/14/95
Project Title/Work Order		EDT No. 604152
B Plant Low Level Waste Integrity Assessment Report		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
E. M. Greager	H6-20	X			
R. D. Gustavson	R1-51	X			
D. E. Jackson	A5-15	X			
R. W. Jacobson	R1-09	X			
W. W. Jenkins	S2-24	X			
S. E. Killoy	S6-70	X			
D. B. Kutsch	S6-70	X			
W. C. Miller	A2-34	X			
E. B. Schwenk	H5-52	X			
K. V. Scott	H5-52	X			
A. R. Sherwood	H6-20	X			
E. J. Walter (3)	H5-52	X			
C. P. Warbington	H5-52	X			
D. W. Wilson	S6-70	X			
Central Files	A3-88	X			