DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Project Definition	Date January 27, 1995
Project Title/Work Order Tank Farm Restoration and Safe Operations, W-314		EDT No. ECN No. 610856

Name	MSIN	Text With All Attach.	Text Only	Attach. / Appendix Only	EDT/ECN Only
D. W. Fritz	H6-22				X
M. S. Bhangoo	R3-27				X
J. E. Blyler	B1-59				X
K. A. Boes	R3-27				X
D. E. Bowers	S6-01				X
M. A. Cahill	R3-25				X
D. J. Carrel	H6-22				X
G. L. Crawford	R2-76				X
C. D. Griner	B1-59				X
M. L. Grygiel	B1-58				X
O. A. Halvorson	T4-08				X
J. L. Homan	H5-09				X
D. L. McGrew	R3-27				X
J. V. Prather	S7-73				X
M. L. Ramsay	S7-52				X
P. L. Smith	B4-68				X
C. E. Sowa	H6-25				X
OSTI (2)	L8-07	X			

Central Files (2) L8-04 2

DISCLAIMER

COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 610856

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	R. C. Garrison, 7E610, H5-09, 376-7587	January 9, 1995
	5. Project Title/No./Work Order No.: Tank Farm Restoration and Safe Operations/W-314	6. Bldg./Sys./Fac. No.: Tank Farms
		7. Impact Level: ESQ
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.): WHC-SD-W314-FRD-001 Rev. 2	9. Related ECN No(s).: None
		10. Related PO No.: None

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	NA	NA — Cog. Engineer Signature & Date	NA — Cog. Engineer Signature & Date

12. Description of Change

The attached document replaces Rev. 2 in its entirety. (No changes were made to Appendices A, B, or D except for the revision number in the header.)

The main body of the document was revised to incorporate references and acronyms from Appendix C, and to reflect changes in the purpose of the document.

Appendix C was added to provide the functions and requirements for the waste transfer system upgrade portion of Project W-314.

13a. Justification (mark one)							
		Criteria Change	[]	Design Improvement	[]	Environmental	[X]
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

Tri-Party Agreement target milestone M-43-05-T02 requires submittal of the Functions and Requirements for the Waste Transfer System Upgrade (formerly Project W-314C) to Washington State agencies by April 30, 1995. Appendix C to WHC-SD-W314-FRD-001 provides those Functions and Requirements.

14. Distribution (include name, MSIN, and no. of copies)

See Distribution Sheet.

RELEASE STAMP

OFFICIAL RELEASE BY WHC DATE FEB 01 1995 Sta 21 38

A-7900-013-2 (06/92) GEF095

0

A-7900-013-1 (06/92)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 610856

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[ ] Yes	Additional	[ ] $	Additional	[ ] $	Improvement	[ ]
[X] No	Savings	[ ] $	Savings	[ ] $	Delay	[ ]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[ ]	Seismic/Stress Analysis	[ ]	Tank Calibration Manual	[ ]
Functional Design Criteria	[ ]	Stress/Design Report	[ ]	Health Physics Procedure	[ ]
Operating Specification	[ ]	Interface Control Drawing	[ ]	Spares Multiple Unit Listing	[ ]
Criticality Specification	[ ]	Calibration Procedure	[ ]	Test Procedures/Specification	[ ]
Conceptual Design Report	[ ]	Installation Procedure	[ ]	Component Index	[ ]
Equipment Spec.	[ ]	Maintenance Procedure	[ ]	ASME Coded Item	[ ]
Const. Spec.	[ ]	Engineering Procedure	[ ]	Human Factor Consideration	[ ]
Procurement Spec.	[ ]	Operating Instruction	[ ]	Computer Software	[ ]
Vendor Information	[ ]	Operating Procedure	[ ]	Electric Circuit Schedule	[ ]
OM Manual	[ ]	Operational Safety Requirement	[ ]	ICRS Procedure	[ ]
FSAR/SAR	[ ]	IEFD Drawing	[ ]	Process Control Manual/Plan	[ ]
Safety Equipment List	[ ]	Cell Arrangement Drawing	[ ]	Process Flow Chart	[ ]
Radiation Work Permit	[ ]	Essential Material Specification	[ ]	Purchase Requisition	[ ]
Environmental Impact Statement	[ ]	Fac. Proc. Samp. Schedule	[ ]		[ ]
Environmental Report	[ ]	Inspection Plan	[ ]		[ ]
Environmental Permit	[ ]	Inventory Adjustment Request	[ ]		[ ]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer RC Garrison	1/11/95	PE	
Cog. Mgr. JL Homan	1/12/95	QA	
QA AY Dingle FOR	1/12/95	Safety	
Safety PL Smith	1/13/95	Design	
Security		Environ.	
Environ. DJ Carrell	1/13/95	Other	
TWRS Projects MA Cahill	1/13/95		
TWRS Programs GL Crawford	1/13/95		
TWRS Systems Engineering ML Grygiel	1/25/95	DEPARTMENT OF ENERGY	
Facilities Operations			
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	

RELEASE AUTHORIZATION

Document Number:	WHC-SD-W314-FRD-001, Rev. 3
Document Title:	Functions and Requirements for Tank Farm Restoration and Safe Operations, Project W-314
Release Date:	1/31/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

V. L. Birkland — 1/31/95

V.L. Birkland

SUPPORTING DOCUMENT

1. Total Pages 280

2. Title

Functions and Requirements for Tank Farm Retoration and Safe Operations, Project W-314

3. Number

WHC-SD-W314-FRD-001

4. Rev No.

3

5. Key Words

ETN-94-0103, W-199, Instrumentation, W-061, Ventilation, W-201, Waste Transfer, W-203, Electrical Distribution, Power, Upgrades, FDC, W-322

APPROVED FOR PUBLIC RELEASE
W. Burkland 1/31/95

6. Author

Name: R. C. Garrison

Signature

Organization/Charge Code
7E610/WO#E24718

7. Abstract

This Functions and Requirements document (FRD) establishes the basic performance criteria for Project W-314, in accordance with the guidance outlined in the letter from R. W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," 94-PRJ-018, dated 3/18/94. The FRD replaces the Functional Design Criteria (FDC) as the project technical baseline documentation.

Project W-314 will improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. The scope of Project W-314 encompasses the necessary restoration upgrades of the Tank Farms' instrumentation, ventilation, electrical distribution, and waste transfer systems.

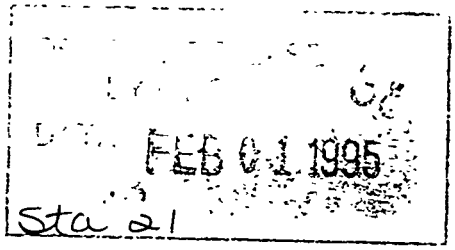
8. **PURPOSE AND USE OF DOCUMENT** - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

9. Approval Designator ESQ

10. RELEASE STAMP



RECORD OF REVISION	(1) Document Number WHC-SD-W314-FRD-001	Page

(2) Title
Functions and Requirements for Tank Farm Restorations and Safe Operations, Project W-314

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
	(7)		
1	Incorporate ECN 605794. This ECN adds Appendix A to the document which describes the Functions and Requirements for the Instrumentation Upgrades portion of W-314. It Adds a background section to the introduction, a figure of the 200 areas, references in section 4.0 and in section 1.4.2, References Supporting Basis of Need, in main document. The header was changed in Appendix B to indicate Rev. 1.	R.C. Garrison	J.L. Homan
2	Incorporate ECN 610852. This ECN adds Appendix D to the document which describes the Functions and Requirements for the Electrical Upgrades portion of W-314. It adds references in section 4.0 and in section 1.4.2, References Supporting Basis of Need, in the main document. The headers were changed in Appendices A and B to indicate Rev. 2.	D.P. Mendoza	J.L. Homan
3 RS	Incorporate ECN 610856. This ECN adds Appendix C to the document which describes the Functions and Requirements for the Transfer System Upgrades portion of W-314. Text related to the purpose and scope of transfer systems were clarified in the main text. It adds references in section 4.0 in the main document. Headers were changed in Appendices A, B and D to indicate Rev. 3.	R.C. Garrison 1/31/95	J.L. Homan 2-1-95

FUNCTIONS AND REQUIREMENTS FOR
TANK FARM RESTORATION AND SAFE OPERATIONS
PROJECT W-314

Issued by:

Westinghouse Hanford Company
Richland, Washington 99352

June 1994

for the
U.S. Department of Energy
Richland Operations Office
Richland, Washington

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

Hazardous radioactive liquid waste resulting from the chemical processing of irradiated nuclear reactor fuel has been stored in underground tanks at the Hanford Site since 1944. These tanks are located in 18 separate groupings (referred to as Tank Farms, see Fig. 1-1) in the 200 East and the 200 West Areas. The tanks contain liquids of varying chemical composition and sludge and/or saltcake formed during evaporation processes. Between 1943 and 1986, 149 single-shell tanks (SSTs) and 28 double-shell tanks (DSTs) were constructed and entered into service.

1.2 PURPOSE

The mission of the Tank Waste Remediation System (TWRS) program is to store, treat, and immobilize highly radioactive tank waste in an environmentally sound, safe, and cost-effective manner. The U.S. Department of Energy (DOE) established this program to manage the 177 underground waste storage tanks at the Hanford site. The TWRS program includes all activities related to receiving, storing, operating and maintaining, treating, and disposing of all liquid wastes.

Numerous external audits and internal self-assessments of Hanford's Tank Farms have revealed that they require extensive restoration to meet the overall TWRS mission goals and support safe operation and maintenance activities. Because of their age and years of little or no upkeep, many Tank Farm infrastructure systems and components:

have exceeded their useful service life and can be expected to fail in the near-term;

have deteriorated beyond repair and must be replaced to ensure continued reliable operation;

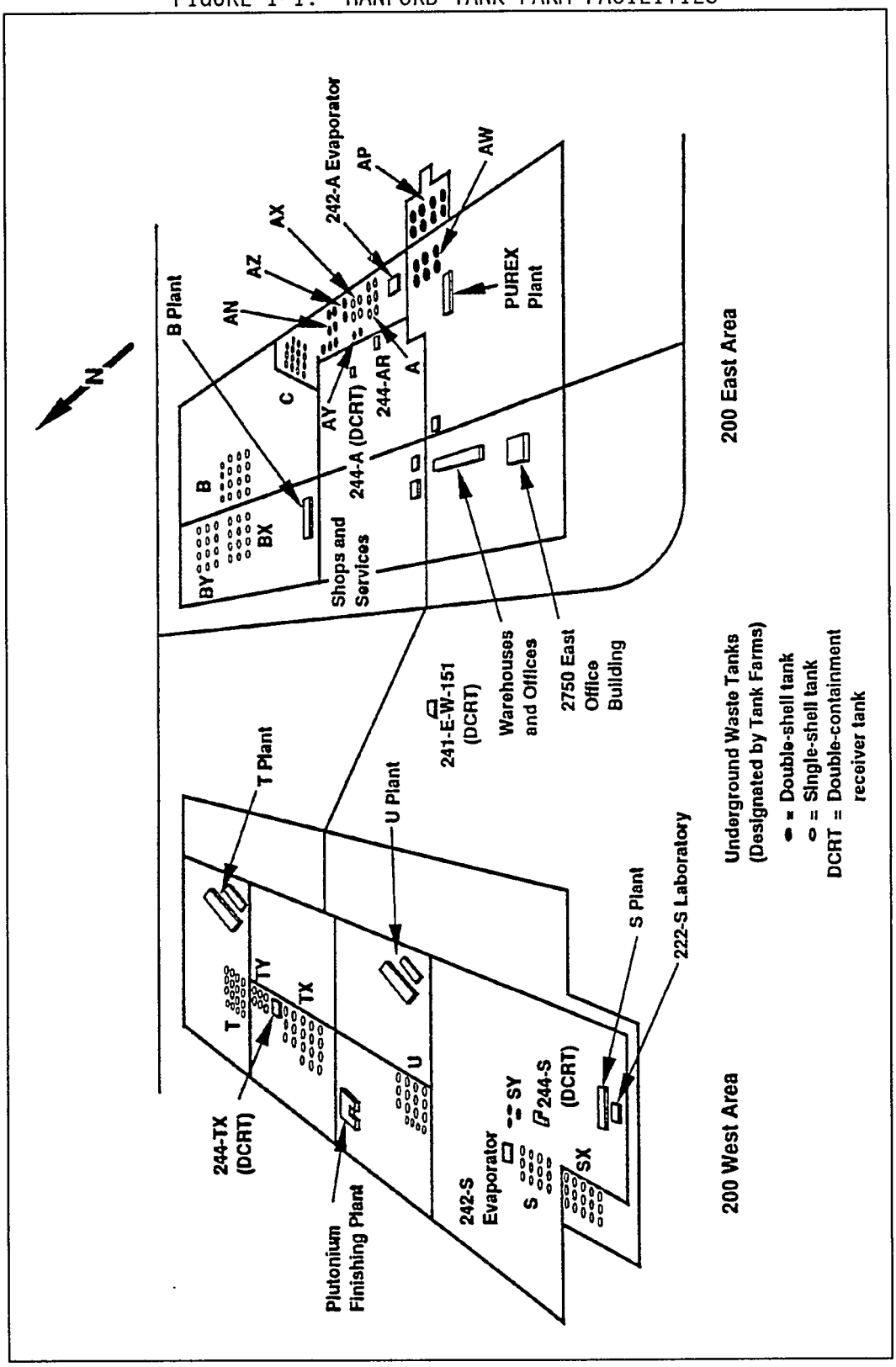
have already failed;

or operate outside current environmental, health, and safety regulations.

Deteriorating infrastructure and a poorly defined physical baseline are expected to increase long-term operation and support costs and possibly limit the number of viable alternatives for retrieval, pretreatment and disposal of tank waste.

To help correct the Tank Farm deficiencies, the Tank Farm Restoration and Safe Operations effort (Project W-314) has been established as a key part of the overall TWRS program. The goal of this project is to improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring

FIGURE 1-1. HANFORD TANK FARM FACILITIES



and/or upgrading existing Tank Farm facilities and systems. The following upgrades have been defined within the overall scope of Project W-314 to accomplish the necessary restoration of the Tank Farms' infrastructure systems.

Instrumentation Upgrade (formerly Project W-314A, Tank Farm Integrated Instrumentation Upgrades)

Ventilation System Upgrade (formerly Project W-314B, Double Shell Tank Ventilation Upgrades)

Transfer System Upgrade (formerly Project W-314C, Transfer System Upgrade)

Tank Farm Electrical Upgrade (formerly Project W-314D, Tank Farm Electrical Upgrades)

The purpose of this document is to define the functions and requirements for Project W-314, by application of the Systems Engineering process. A function is a definition of what a system or subsystem must accomplish to meet the overall mission; a requirement is a qualitative or quantitative statement of how well a function must be performed. Within TWRS, requirements may be one of two types: constraints and performance requirements. Constraints are imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders). Performance requirements are imposed upon the function by the TWRS Program itself and therefore may be traded with respect to other performance requirements to optimize overall performance. The document also identifies the interfaces between project functions, and between the project and the external environment.

The Appendices to this document provide details of the functions and their associated requirements identified for each of the four upgrades areas listed above. See Section 2.0 of this document for details about the functions and requirements development process.

1.3 SCOPE

The Tank Farm Restoration and Safe Operations project includes upgrades to the instrumentation, ventilation, waste transfer, and electrical distribution systems for Tank Farms, as described below. The various aspects of the project will be integrated to support overall TWRS program objectives.

The objective of the Instrumentation Upgrade is to provide instrumentation and data acquisition/analysis equipment necessary for safe and efficient operation of the Tank Farms. The scope of the Instrumentation Upgrade includes the double shell tank farms and the waste transfer system (see WHC-SD-W314A-ES-002 Rev. 0, W-314A Study Comparison to Cost Trade-off Options). Selected signals from existing monitoring systems (SSTs and DCRTs) may be added to the upgraded monitoring system.

The objective of the Ventilation System Upgrade is to restore active tank ventilation systems to an acceptable design basis as required to support the TWRS mission, and to resolve environmental, health, and safety concerns. The scope of the upgrade is focused primarily on the double-shell tanks

(DSTs), but includes selected single-shell tanks (SSTs), and any double-contained receiver tanks (DCRTs) that will be used by the Transfer System Upgrade.

The objective of the Transfer System Upgrade is to provide regulatory compliant pipelines from SST farms to the cross-site transfer lines. These new waste transfer lines will comply with state and federal regulations requiring secondary containment, leak detection, and cathodic protection, and will support future waste retrieval and disposal missions. The scope of Project W-314 includes upgrades of the waste transfer pipelines in the A complex (Tank Farms 241-A, -AN, -AP, -AW, -AX, -AY, and -AZ), and a pipeline to serve the 200 West Area tank farms and other selected waste generators. The upgraded system will connect with the transfer lines provided by Project W-058, Replacement of the Cross-Site Transfer System; Project W-028, Aging Waste Transfer System; and the Retrieval Program.

The objective of the Tank Farm Electrical Upgrade is to restore the Tank Farms power distribution systems to an acceptable design basis, and to support the added power demands expected from other restored/upgraded systems (ventilation, instrumentation, etc.) and future cleanup activities. The scope of the upgrade includes primary, alternate, and backup power supplies to all existing and future essential loads. Equipment to be upgraded includes selected substations, transformers, switchgear, motor control centers, distribution panels, and cable runs to the loads.

The appendices provide further details of the scopes of the various upgrades.

1.4 JUSTIFICATION

1.4.1 Basis of Need

The Tank Farms Restoration and Safe Operations project will help ensure that the Hanford Tank Farm infrastructure will be able to support safe near-term storage, and subsequent retrieval for treatment and disposal, of liquid wastes. The capital improvements provided by this project will improve the margin of safety for the Tank Farms operations and bring affected Tank Farm systems into closer compliance with applicable Federal, state, and local regulations. Secondary benefits of the project include reduced down-time as well as reduced risk of personnel and environmental exposure to radioactive and hazardous releases.

The project directly supports the first two Environmental Management Program Goals established by the DOE's Assistant Secretary for Environmental Restoration and Waste Management, i.e., "manage and eliminate urgent risks and inherent threats", and "provide a safe workplace free from accidents, injuries and adverse health effects". It also supports the Secretary of Energy's TWRS Safety Initiatives "infrastructure upgrades" and "improved worker safety/conduct of operations".

Project W-314 is an important element in the renegotiated *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), which establishes legally enforceable milestones, including major Milestone "M-43-

00, Complete Tank Farm Upgrades, June 2005". This milestone addresses a broad range of upgrades that will be provided by the project. In addition, Project W-314 supports Milestone "M-40-00, Mitigate/Resolve Tank Safety Issues for High Priority Watch List Tanks," since the resolution of some of these issues depend upon the upgrades included in this project.

Upgrade of selected ventilation system components is necessary for compliance with the Clean Air Act and 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*, as detailed in WHC Incoming Correspondence No. 9401181, *NESHAPS Federal Facility Compliance Agreement*. This Agreement between RL and Region 10 of the EPA constitutes a plan to achieve and maintain compliance at the Hanford Site with applicable requirements under the Clean Air Act, as amended, its implementing regulations, and Executive Order 12088.

Details of the justification for the specific upgrades are discussed in the Engineering Studies and related documents listed below.

1.4.2 References Supporting the Basis of Need

- 10 CFR 835 (Released Draft), *Occupational Radiation Protection*. This regulation supports the Environmental Management Program Goals and the TWRS Safety Initiatives cited above.

- DOE Memorandum PRJ:MLR/94-PRJ-041, "Tank Farm Restoration and Safe Operations (TFRSO) Major Systems Acquisition (MSA, 96-D-XXX), Request for Key Decision (KD) 0 and Submittal of the Justification of Mission Need (JMN)," dated May 20, 1994. The JMN fully describes the programmatic and technical justification for initiating Conceptual Design for Project W-314, Tank Farm Restoration and Safe Operations.

- DOE Order 5480.19, *Conduct of Operations*. This order supports the TWRS Safety Initiative "improved worker safety/conduct of operations".

- *Hanford Federal Facility Agreement and Consent Order*. This is the Tri-Party Agreement, between the Washington State Department of Ecology, the U.S. Environmental Protection Agency (EPA), and the DOE. Project W-314 is necessary to meet TPA Milestone M-43-00, and to support TPA Milestone M-40-00.

- Los Alamos Technical Associates, Inc., *An Engineering Review of Tank Farm Ventilation Systems*, March 1993. This document describes the current condition of the ventilation systems, and establishes the need for replacement of these ventilation systems based on component age, safety, and future needs.

- WHC Incoming Correspondence No. 9401181, *NESHAPS Federal Facility Compliance Agreement*. The agreement designates the stacks that are required to have radionuclide emission measurements made in accordance with the requirements of 40 CFR 61.93(b).

- WHC-EP-0392 Rev. 1, *Tank Farms Restoration and Upgrades Program Plan*. This document provides an overview of planned Tank Farm Upgrades,

including descriptions, justifications, and interfaces between the various tasks.

- WHC-SD-W314A-ES-001 Rev. 0, *Project W-314A Tank Farm Integrated Instrumentation System Upgrade Engineering Study*. This document provides specific and detailed information on the issues driving the instrumentation system upgrade.

- WHC-SD-W314A-ES-002 Rev. 0, *W-314A Study Comparison to Cost Trade-off Options*. This document validates a recommended option for instrumentation upgrades based on cost versus value added.

- WHC-SD-W314B-DA-001 Rev. 0, *Tank Vapor Mitigation Requirements for Selected Tank Farms*. This document provides tank vapor characterization information, including the identification of the regulatory requirements governing mitigation of each identified vapor constituent.

- WHC-SD-W314C-ES-001 Rev. 0, *Project W-314C Transfer System Upgrades Engineering Study*. This document provides specific and detailed information on the issues driving the transfer system upgrade.

- WHC-SD-WM-ES-284 Rev. 0, *Engineering Study, Double-Shell Tank Ventilation Upgrades, Project W-314B*. This document provides specific and detailed information on the issues driving the ventilation system upgrades, including mitigation of tank safety issues, support of the tank waste retrieval and disposal mission, compliance with state and federal laws, and deterioration due to aging of the existing systems.

- *Site Electrical Assessment Report 200 Area Tank Farms*, November 1989, Westinghouse Hanford Company. This report summarized the findings from the assessment performed on the tank farms electrical distribution system. To date 109 of 181 electrical items remain open.

- WHC-SD-W314D-ES-001 Rev. 0 (Draft), *Tank Farms Electrical Upgrades Engineering Study*, June 1994, Westinghouse Hanford Company. This document provides the scope of the Tank Farms Electrical Upgrades project and the detailed information on the current state of the tank farms electrical system. It also provides the recommended approach to resolving the current electrical systems deficiencies and providing a system with the capacity and capability to meet the tank farms mission.

2.0 APPLICATION OF SYSTEMS ENGINEERING APPROACH

In November 1992 the TWRS Program Leadership Council directed that systems engineering be applied in the development and management of the TWRS program. Systems engineering is an iterative process consisting of four activities: functional analysis, synthesis, evaluation, and a description of system elements. This document provides the functional analysis for Project W-314, as directed by DOE-RL.

Functional analysis defines a baseline of functions and function performance requirements which must be met in order to adequately accomplish the operation, support, test, and production requirements of the system. The process begins with the identification of top level functions and ends with the allocation of those functions to lower level elements within the system. Functional analysis is a method for analyzing performance requirements and dividing them into discrete tasks or activities. It involves identifying the system's primary functions, and decomposing those functions into subfunctions at ever-increasing levels of detail. Interfaces between functions and with the outside environment are also identified. More information about systems engineering can be found in the *Systems Engineering Management Guide*, prepared by the Defense Systems Management College, January 1990.

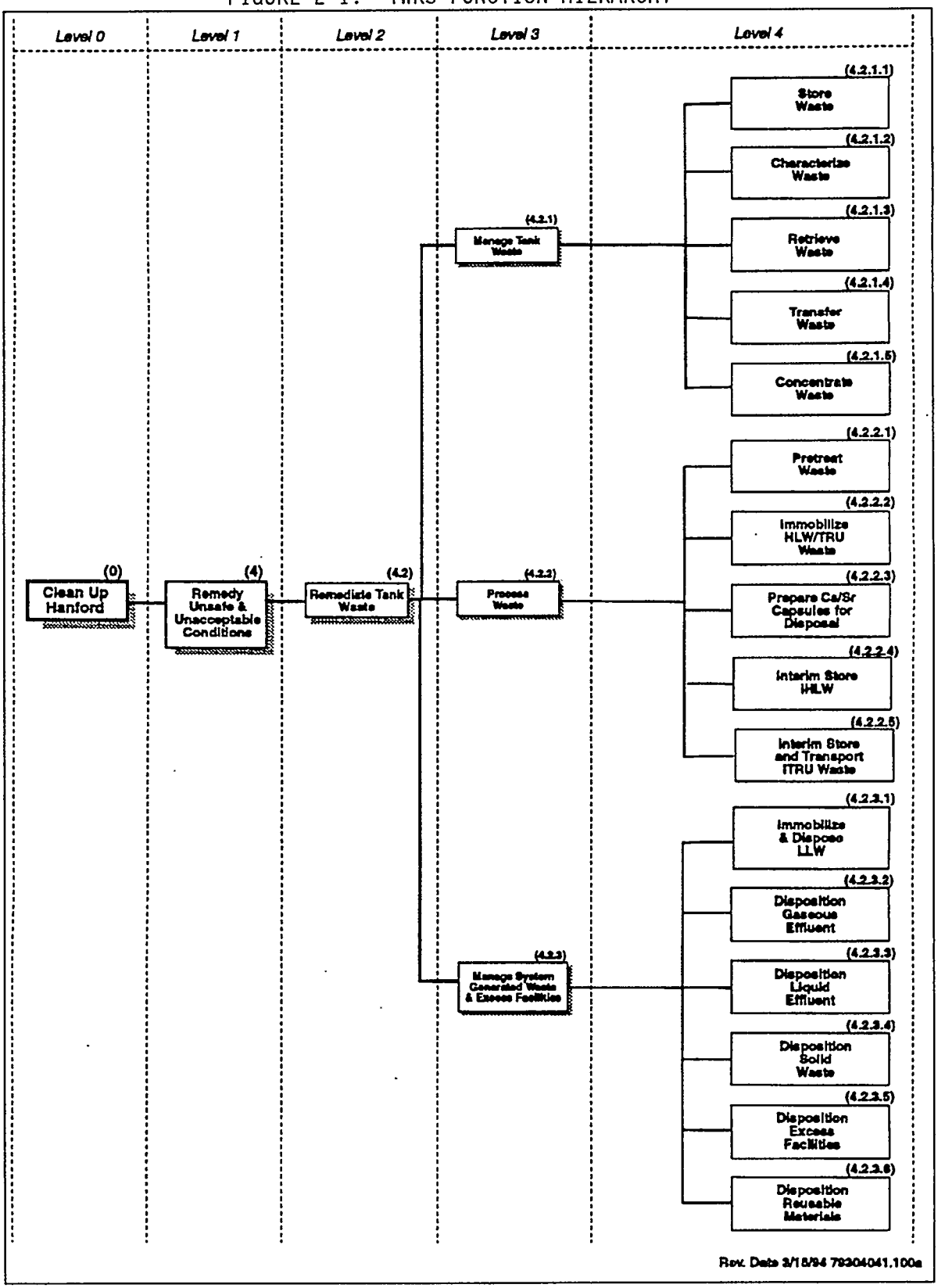
The top four levels of functions, requirements, and system architecture necessary to perform the TWRS mission are defined in DOE/RL-92-60 Rev. 1 (Released Draft), *Tank Waste Remediation System Functions and Requirements*. Figure 2-1 shows the hierarchy of the top four TWRS functions. The TWRS systems engineering process is described in DOE/RL-93-0106, Annex 2 (TBR), *TWRS Systems Engineering Management Plan*. The process will continue by further decomposition of the functions, requirements, and system architecture.

Specific functions and requirements were developed for Project W-314. These project-specific functions are several levels below the current TWRS baseline definition, which is based on fourth-level functions. Therefore, certain enabling assumptions were made to bridge the gap and allow the identification of the highest level project-specific functions. The Appendices to this document provide details of the project-specific functions, and their associated requirements, as follows.

Appendix A: Functions and Requirements for Instrumentation Upgrade
Appendix B: Functions and Requirements for Ventilation System Upgrade
Appendix C: Functions and Requirements for Transfer System Upgrade
Appendix D: Functions and Requirements for Tank Farm Electrical Upgrade

Each Appendix identifies the TWRS fourth-level functions supported by the respective upgrade, and the assumptions enabling the decomposition of those functions to the project level. Also provided in each Appendix are details of the project-specific function hierarchy, the requirements allocated to each function, and the interfaces (inputs and outputs) of each function.

FIGURE 2-1. TWRS FUNCTION HIERARCHY



3.0 GENERAL REQUIREMENTS

In addition to the requirements allocated to specific functions, as identified in the appendices, the following requirements shall apply to MSA Project W-314.

The project must recognize and address all requirements listed below and in the appendices. Each requirement shall be met, or shall be waived or exempted using the appropriate process.

Any requirement meeting one or more of the following criteria must be reviewed for possible waiver or exemption.

- Compliance with the requirement adds little value to the final product but significantly increases the project cost.
- The requirement mandates activities, reports, analysis, design features, or physical features which exceed sound technical or managerial judgement.
- The requirement exceeds managerial or technical requirements for comparable for-profit industrial waste storage and cleanup sites.

3.1 DESIGN REQUIREMENTS

The design of systems, structures, and components provided by this project shall be in accordance with DOE Order 6430.1A, *General Design Criteria*, except where formal criteria deviations are approved by the cognizant DOE authority. The requirements of the "-99" Sections in all of the divisions and all of the Division 13 requirements of that order, as applied to nonreactor nuclear facilities and radioactive liquid waste facilities, are applicable to this project.

The design of systems, structures, and components shall comply with the requirements of RL Implementing Procedure (RLIP) 6430.1C, *Hanford Plant Standards (HPS) Program*, including but not limited to Standard Design Criteria specifically referenced in this document.

Systems, structures, and components important to safety shall be designed to withstand the effects of natural phenomena, including seismic, wind, and missile events. A graded approach to applying natural phenomena criteria shall be employed as described in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*, and Hanford Plant Standards, Standard Design Criteria HPS-SDC-4.1, Revision 12, *Design Loads for Facilities*.

Energy conservation shall be considered in the selection of components using the criteria given in DOE Order 6430.1A, with the objective to minimize consumption of nonrenewable energy sources and to encourage the use of renewable energy sources. Systems, facilities, and services provided by this project shall be designed for year-round operation. Existing site utilities shall be used to the maximum extent practicable.

3.2 SAFETY REQUIREMENTS

Structures, systems, and components are categorized into safety classes, as defined in WHC-CM-1-3, *Management Requirements and Procedures*, MRP 5.46, "Safety Classification of Systems, Components and Structures." The safety classes for systems, structures, and components provided by this project will be determined during the project's Hazard Analysis and Preliminary Safety Evaluation activities. The safety classification is used in establishing a graded approach to the selective application of safety and environmental requirements, as described in MRP 5.46. The highest safety classification anticipated for any system, structure, or component to be provided by the Ventilation System Upgrade is Safety Class 2 (reference WHC-SD-W314B-HC-001 Rev. 0, *Hazard Classification for Double-Shell Tank Ventilation Upgrades, Project W-314B*). Hazard classification for the other upgrades of Project W-314 has not been completed.

Personnel exposure to radiation and hazardous substances shall be mitigated by employing the As Low As Reasonably Achievable (ALARA) process, which incorporates shielding and design configuration. Shielding shall be provided in accordance with the exposure limits of DOE Orders 5400.5, *Radiation Protection of the Public and the Environment*, and 5480.11, *Radiation Protection for Occupational Workers*.

Equipment and facilities shall be designed in accordance with the safety requirements of the following:

10 CFR 835, *Occupational Radiation Protection*

29 CFR 1910, *Occupational Safety and Health Standards*

RL Order 5480.1A, *Environmental, Safety, and Health Program for Department of Energy Operations for Richland Operations*

DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*

RL Order 5480.4C, *Environmental Protection, Safety, and Health Protection Standards for RL*

DOE Order 5480.7A, *Fire Protection*

RL Implementing Directive (RLID) 5480.7, *Fire Protection*

DOE Order 5480.10, *Contractor Industrial Hygiene Program*

RLIP 5480.10, *Industrial Hygiene Program*

3.3 QUALITY ASSURANCE REQUIREMENTS

A project-specific Quality Assurance Program Plan (QAPP) shall be developed during Conceptual Design and approved/released prior to definitive design. The QAPP implements the quality criteria of DOE Order 5700.6C, *Quality Assurance*, through the selective and judicious use of ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*. The quality program shall provide for a graded approach to the selective application of those active requirements. The basis for establishing that graded approach is the safety classification assigned to systems, structures, and components as described in Section 3.2 above.

Quality Assurance (QA)/Quality Control (QC) activities for all contractors involved in design, construction, inspection, testing and acceptance shall be executed in accordance with the QAPP. The QAPP shall be used by the design contractor to develop verification criteria in design documents, (drawings, specifications, test procedures), and to define quality assurance interfaces for specific requirements and responsibilities on the project.

3.4 ENVIRONMENTAL REQUIREMENTS

The project shall comply with the requirements of DOE Order 5400.1, *General Environmental Protection Program*, as implemented by RLIP 5400.1, *General Environmental Protection Program*, and with the requirements of WHC-CM-7-5, *Environmental Compliance*.

3.5 DECONTAMINATION AND DECOMMISSIONING

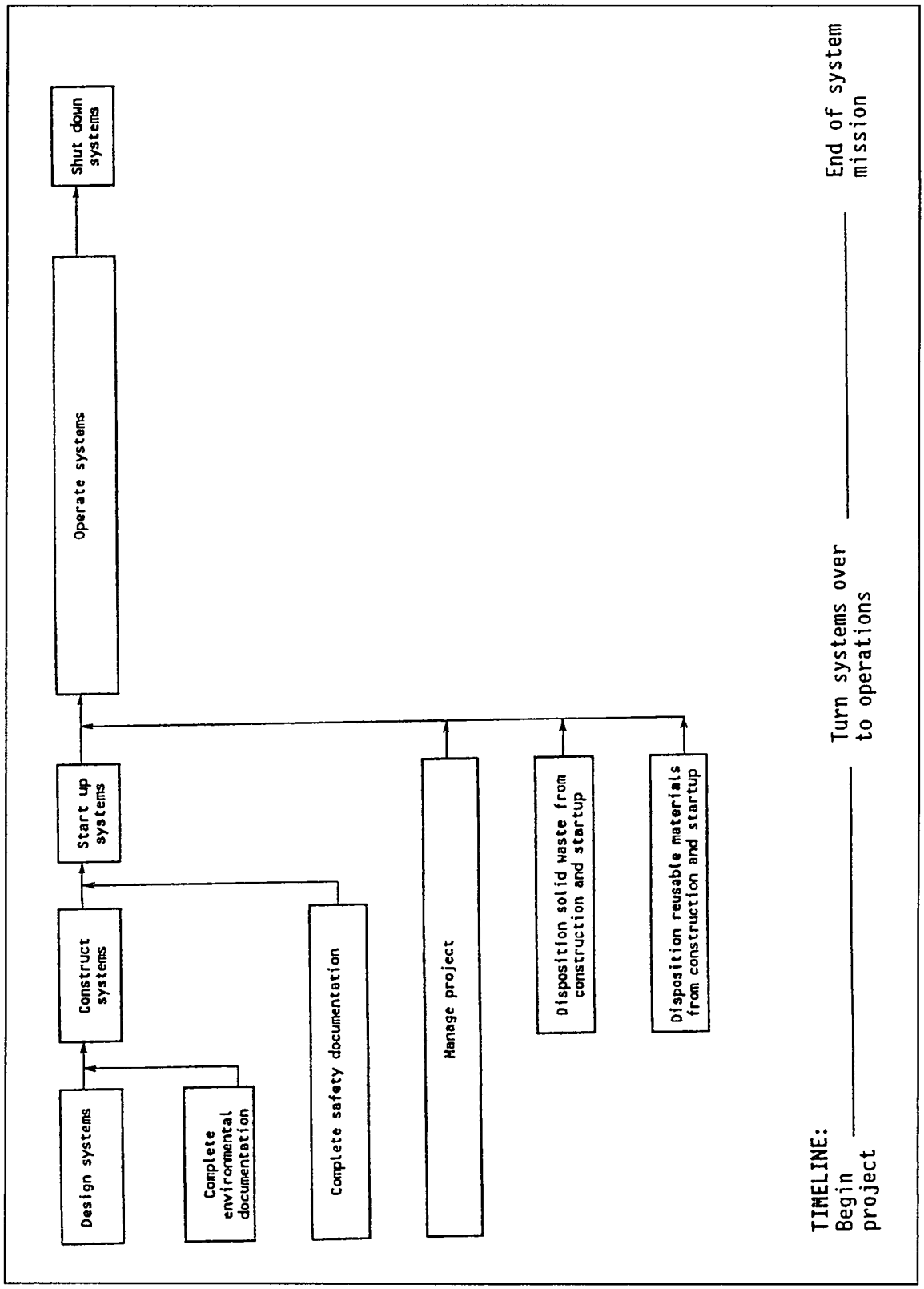
Existing equipment that is being replaced shall be decommissioned as necessary after the new systems are operational. Abandonment of equipment in place is permissible when that option can be shown to be the best economic and technical approach. Equipment and facilities provided by this project shall be designed to facilitate decontamination and ultimate decommissioning in accordance with DOE Order 6430.1A.

3.6 PROJECT MANAGEMENT AND INTERFACE CONTROL

The MSA shall be managed in accordance with DOE Order 4700.1, *Project Management System*, as implemented by RLIP 4700.1A, *Project Management System*, and other supplemental guidance provided by the Department of Energy. See Figure 3-1 for a diagram showing the life cycle of the upgraded systems provided by the MSA.

Close coordination between Project W-314 and other planned/ongoing projects and activities shall be maintained throughout the definition, design, and construction phases.

FIGURE 3-1. MSA W-314 UPGRADES LIFE CYCLE



4.0 REFERENCES

The following list is not intended as a stand-alone list of requirements to be met by Project W-314. Each reference listed below is cited in the main body of this document and/or in one or more of the Appendices.

4.1 REGULATIONS, ORDERS, CODES, AND STANDARDS

5 CFR 1320, *Paperwork Reduction Act*

10 CFR 20, *Standards for Protection Against Radiation*

10 CFR 61.40, 43, *Licensing Requirements for Land Disposal of Radioactive Waste*

10 CFR 835, *Occupational Radiation Protection*

29 CFR 1910, *Occupational Safety and Health Standards*

40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*

40 CFR 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes*

40 CFR 260, *Hazardous Waste Management System: General*

40 CFR 261, *Identification and Listing of Hazardous Waste*

40 CFR 262, *Standards Applicable to Generators of Hazardous Waste*

40 CFR 264, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*

40 CFR 265, *Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*

40 CFR 268, *Land Disposal Restrictions*

49 CFR 173.443, *Contamination Control*

ANSI/IEEE-498, *Standard Requirements for the Calibration and Control of Measuring and Test Equipment Used in Nuclear Facilities (1985)*

ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities (1989)*

DOE/EH-0135, *Performance Objectives and Criteria for Technical Safety Appraisals at DOE Facilities and Sites*

DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*

DOE/EH-0256, *Radiation Control Manual*

DOE/EP-0108, *Standard of Fire Protection of DOE Electronic Computer/Data Processing Systems*

DOE/EV-1830-T5, *A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)*

DOE Order 1324.2A, *Records Disposition*

DOE Order 1324.5A, *Records Management Program*

DOE Order 1330.1D, *Computer Software Management*

DOE Order 1360.1B, *Acquisition and Management of Computing Resources*

DOE Order 1360.2B, *Unclassified Computer Security Program*

DOE Order 1360.4B, *Scientific and Technical Computer Software*

DOE Order 1360.6A, *Automatic Data Processing Equipment/ Data Systems*

DOE Order 4300.1C, *Real Property Management*

DOE Order 4320.2, *Capital Asset Management Process*

DOE Order 4330.2D, *In House Energy Management*

DOE Order 4330.4B, *Maintenance Management Program*

DOE Order 4700.1, *Project Management System*

DOE Order N 4700.5, *Project Control Systems Guidelines*

DOE Order N 4700.6, *Extension of DOE N 4700.5*

DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*

DOE Order 5400.1, *General Environmental Protection Program*

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*

DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*

DOE Order 5480.5, *Safety of Nuclear Facilities*

DOE Order 5480.6, *Safety of Department of Energy Owned Reactors*

DOE Order 5480.7A, *Fire Protection*

DOE Order 5480.10, *Contractor Industrial Hygiene Program*

DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

DOE Order 5480.19, *Conduct of Operations*

DOE Order 5480.20, *Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities*

DOE Order 5480.23, *Nuclear Safety Analysis Reports*

DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*

DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*

DOE Order 5700.6C, *Quality Assurance*

DOE Order 5820.2A, *Radioactive Waste Management*

DOE Order 6430.1A, *General Design Criteria*

DOE Order 6430.1C, *Hanford Plant Standards Program*

DOE-RL Implementing Procedure 1330.1B, *Computer Software Management*

DOE-RL Order 5480.1A, *Environmental, Safety, and Health Program for Department of Energy Operations for Richland Operations*

DOE-RL Order 5480.4C, *Environmental Protection, Safety, and Health Protection Standards for RL*

DOE-RLID 5480.7, *Fire Protection*

DOE-RLIP 4700.1A, *Project Management System*

DOE-RLIP 5300.1C, *Telecommunications Management*

DOE-RLIP 5400.1, *General Environmental Protection Program*

DOE-RLIP 5480.10, *Industrial Hygiene Program*

DOE-RLIP 5480.11, *Radiation Protection for Occupational Workers*

DOE-RLIP 6430.1C, *Hanford Plant Standards (HPS) Program*

HPS-SDC-4.1, Revision 12, *Design Loads for Facilities*

INPO-85-013, *Plant Modification Control Program*

INPO-86-023, *Guidelines for Nuclear Power Station Construction Projects, "Good Practices"*

INPO-87-030, *Performance Evaluations and Criteria for Corporate Evaluations*

INPO-90-009, *Guide-lines for Conduct of Design Engineering*

MIL-STD-1472C, *Human Engineering Design Criteria for Military Systems, Equipment, and Facilities*

NFPA-72, *National Fire Protection Codes*

NRC 4.15, *Quality Assurance for Radiation Monitoring (Normal Operations) - Effluent Streams and the Environment*

RLID 5820.2A, *Radioactive Waste Management*

WAC 173-303, *Dangerous Waste Regulations*

WAC 173-360, *Underground Storage Tank Regulations*

WAC 173-400, *General Regulations for Air Pollution Sources*

WAC 173-401, *Operating Permit Regulation*

WAC 173-460, *Controls for New Sources of Toxic Air Pollutants*

WAC 173-470, *Ambient Air Quality Standards for Particulate Matter*

WAC 173-480, *Ambient Air Quality Standards and Emission Limits for Radionuclides*

WAC 246-247, *Radiation Protection - Air Emissions*

WHC-CM-1-3, *Management Requirements and Procedures*; MRP 5.46, *"Safety Classification of Systems, Components and Structures"*

WHC-CM-1-6, *WHC Radiological Control Manual*

WHC-CM-4-9, *Radiological Design*

WHC-CM-4-11, *ALARA Program Manual*

WHC-CM-7-5, *Environmental Compliance*

WHC-SD-WM-OCD-15, *Tank Farm Waste Compatibility Program*, page 7

4.2 SUPPORTING INFORMATION

Defense Systems Management College, *Systems Engineering Management Guide*, January 1990

DOE-RL Letter 94-PRJ-018, R. W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," dated March 17, 1994

DOE-RL Memorandum PRJ:MLR/94-PRJ-041, "Tank Farm Restoration and Safe Operations (TFRSO) Major Systems Acquisition (MSA, 96-D-XXX), Request for Key Decision (KD) 0 and Submittal of the Justification of Mission Need (JMN)," dated May 20, 1994

DOE-RL 90-2, *Defense Nuclear Facilities Safety Board (DNFSB)*

DOE/RL-92-60 Rev. 1 (Released Draft), *Tank Waste Remediation System Functions and Requirements*

DOE/RL-93-0106, Annex 2 (TBR), *TWRS Systems Engineering Management Plan*

Los Alamos Technical Associates, Inc., *An Engineering Review of Tank Farm Ventilation Systems*, March 1993

S/RID, *Tank Farms Standards/Requirements Identification Document*, Draft dated September 30, 1993

WHC-EP-0392 Rev. 1, *Tank Farms Restoration and Upgrades Program Plan*

WHC-SD-W314A-ES-001 Rev. 0, *Project W-314A Tank Farm Integrated Instrumentation System Upgrade Engineering Study*

WHC-SD-W314A-ES-002 Rev. 0, *W-314A Study Comparison to Cost Trade-off Options*

WHC-SD-W314B-DA-001, *Tank Vapor Mitigation Requirements for Selected Tank Farms*

WHC-SD-W314B-HC-001 Rev. 0, *Hazard Classification for Double-Shell Tank Ventilation Upgrades, Project W-314B*

WHC-SD-W314C-ES-001 Rev. 0, *Project W-314C Transfer System Upgrades Engineering Study*

WHC-SD-WM-ES-284 Rev. 0, *Engineering Study, Double-Shell Tank Ventilation Upgrades, Project W-314B*

WHC-SD-WM-RPT-075 Rev. 0, *Recommendation on Need for an Exhauster on 241-A-105*

WHC-SD-W314D-ES-001 Rev. 0 (Draft), *Tank Farms Electrical Upgrades Engineering Study*

Hanford Federal Facility Agreement and Consent Order

NFPA, 1993, *National Electrical Code*, NFPA 70-1990, National Fire Protection Association, Quincy, Massachusetts.

ANSI, 1993, *National Electrical Safety Code*, ANSI C2 Handbook, American National Standards Institute, New York, New York.

WHC-SD-WM-ISB-001, Rev.0, Hanford Site Tank Farm Facilities Interim Safety Basis

WHC-SD-WM-OSR-004, Rev.1, Double Shell Tank Interim Operational Safety Requirements

WHC-SD-WM-OSR-005, Rev.0, Single Shell Tank Interim Operational Safety Requirements

WHC-SD-WM-OSR-016, Rev.0, Aging Waste Facilities Interim Operational Safety Requirements

WHC-SD-WM-SEL-026, Rev.1, Double Shell Tanks Interim Safety Equipment List

WHC-SD-WM-SEL-027, Rev.1, SST Farms Interim Safety Equipment List

WHC-SD-WM-SEL-020, Rev.2, Aging Waste Facility Interim Safety Equipment List

WHC-SD-GN-DGS-303, Backup Electrical Power System Definitions and Design Criteria

WHC-SD-WM-SAR-016, Rev.1, Double Shell Tank Farm Facility Safety Analysis Report

WHC-SD-WM-SAR-010, Rev.1, Aging Waste Facility Safety Analysis Report

GLOSSARY

ABBREVIATIONS, ACRONYMS, AND INITIALISMS

ALARA	As Low as Reasonably Achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWG	Area Waste Generator
CFR	Code of Federal Regulations
DCRT	Double-Contained Receiver Tank
DOE	U.S. Department of Energy
DOE-HQ	DOE Headquarters
DOE-RL	DOE Richland Operations Office
DST	Double-Shell Tank
EPA	U.S. Environmental Protection Agency
FDS	Function Description Sheet
HLW	High Level Waste
KEH	Kaiser Engineers Hanford
LLW	Low Level Waste
LWTS	Liquid Waste Transfer System
MLW	Move Liquid Waste
MTTR	Mean Time To Repair
N/A	Not Applicable. (In Appendix C, "N/A" means that the applicable description was already provided elsewhere.)
PFP	Plutonium Finishing Plant
RCW	Receive And Condition Waste
RL	DOE Richland Operations Office
RLIP	RL Implementing Procedure
S/RID	Tank Farms Standards/Requirements Identification Document
SST	Single-Shell Tank
TBD	To Be Determined
TBR	(as used in Appendix C) To Be Revised
TBR	(Other than Appendix C) To be released; document is in approval cycle
TLW	Transfer Liquid Waste
TPA	Tri-Party Agreement
TRU	Transuranic
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WHC-CM	WHC Controlled Manual
WRF	Waste Receiver Facility
WTS	Waste Transfer System

DEFINITIONS OF TERMS

Confinement System. The barrier and its associated systems (including ventilation) between areas containing hazardous materials and the environment or other areas in the facility that are normally expected to have levels of hazardous materials lower than allowable concentration limits.

Constraint. A requirement imposed on a function by the external environment (e.g., U.S. Congress, Washington Department of Ecology, DOE Orders).

Decomposition. The process of breaking down functions, requirements, and architectural concepts into sub-elements at increasing levels of detail. An integral part of Functional Analysis.

Function. A primary statement of purpose; a definition of what a system or subsystem must accomplish to meet the overall mission.

Functional Analysis. A method for analyzing performance requirements and dividing them into discrete tasks or activities. The first step of the Systems Engineering process.

Interface. An input or an output.

Input. Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

Output. Anything that leaves a function after it has been acted upon by that function.

Performance Requirement. A requirement imposed on a function by the TWRS program itself, which therefore may be traded with respect to other performance requirements to optimize overall performance.

Requirement. A qualitative or quantitative statement of how well a function must be performed. Requirements may be one of two types: constraints and performance requirements.

System. A set or arrangement of things that are related and form an organic whole. Relationships tie the system together.

Systems Engineering. A process that transforms an operational need into a description of system parameters and integrates those parameters to optimize the overall system effectiveness.

APPENDIX A

FUNCTIONS AND REQUIREMENTS FOR

INSTRUMENTATION UPGRADE

NOTE: The requirements presented in this appendix are binding.

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

1.1 PURPOSE

Instrumentation Upgrade will provide the instrumentation and data acquisition/analysis equipment necessary for safe and efficient operation of the Tank Farms. Additionally, automated data acquisition systems will be provided to accurately monitor Tank Farm conditions and provide timely analysis of physical and chemical anomalies. Due to their age, many instrumentation arrays in double shell tanks (DSTs) have failed and many of those still in operation are unreliable and lack the technical documentation and repair parts necessary to effectively maintain them. Existing surveillance systems are approaching obsolescence and should be replaced with a new centralized Tank Farm monitoring and control system to enhance data acquisition, alarm capabilities, reliability, and to reduce the in-area stay-time of Tank Farm operations and maintenance personnel. Required monitoring of Single Shell Tanks (SSTs) and Double Contained Receiver Tanks (DCRTs) are covered by ongoing instrumentation upgrades. Integration with ongoing upgrades shall continue throughout the project.

1.2 SCOPE

Instrumentation Upgrade shall encompass all new and existing monitoring instrumentation, raceways, support equipment and service buildings for DST's and their respective tank farms. The project also covers monitoring instrumentation, raceways, support equipment and service buildings for the waste transfer system between tank farms, from waste producers, and to waste treatment facilities. The waste transfer system includes all active system components for hazardous waste transfer.

Included in this scope is a new networked automated data collection system with support buildings local to peripheral equipment and a central surveillance complex. Existing instrumentation shall be analyzed to determine if they are still needed for the remediation mission. Required instrumentation shall be repaired or replaced. Instrumentation no longer required and instrumentation replaced by this project shall be removed. Shelter shall be provided, as required, for selected components and for personnel operating and maintaining the systems. Removal and disposition of existing equipment, as necessary, is also included in the scope.

The scope also includes routing electrical power and other required utilities to instrumentation and data acquisition system components.

Interfaces with the other upgrades provided by Project W-314 will be identified as the functions become available in the other appendices. In addition to those interfaces, Instrumentation Upgrade shall interface with existing systems and facilities (see WHC-SD-W314A-ES-002 Rev. 0, W-314A Study Comparison to Cost Trade-off Options).

2.0 INSTRUMENTATION UPGRADE FUNCTIONS AND REQUIREMENTS

Specific functions and requirements were developed for the Instrumentation Upgrade to meet the requirements of DOE/RL-93-0106, Annex 2 (TBR), *TWRS Systems Engineering Management Plan*. Each function is decomposed from a TWRS fourth-level function as identified in DOE/RL-92-60 Rev. 1 (Released Draft), *Tank Waste Remediation System Functions and Requirements*.

The functions, requirements, and interfaces identified below will be used to develop a project design concept. The functions, requirements, and interfaces will then be further refined to provide a basis for detailed design.

The TWRS Systems Engineering process will continue as described in DOE/RL-93-0106, Annex 2 (TBR). As each step in the process is completed, the functions and requirements identified for the Instrumentation Upgrade will be evaluated, and revised if necessary, to maintain continuity with the TWRS functions and requirements.

Section 2.3 of this appendix identifies the interfaces between the upgrade-specific functions, between the upgrade and the TWRS program, and between the upgrade and the external environment. Section 2.4 lists the requirements allocated to the functions and interfaces of the upgrade.

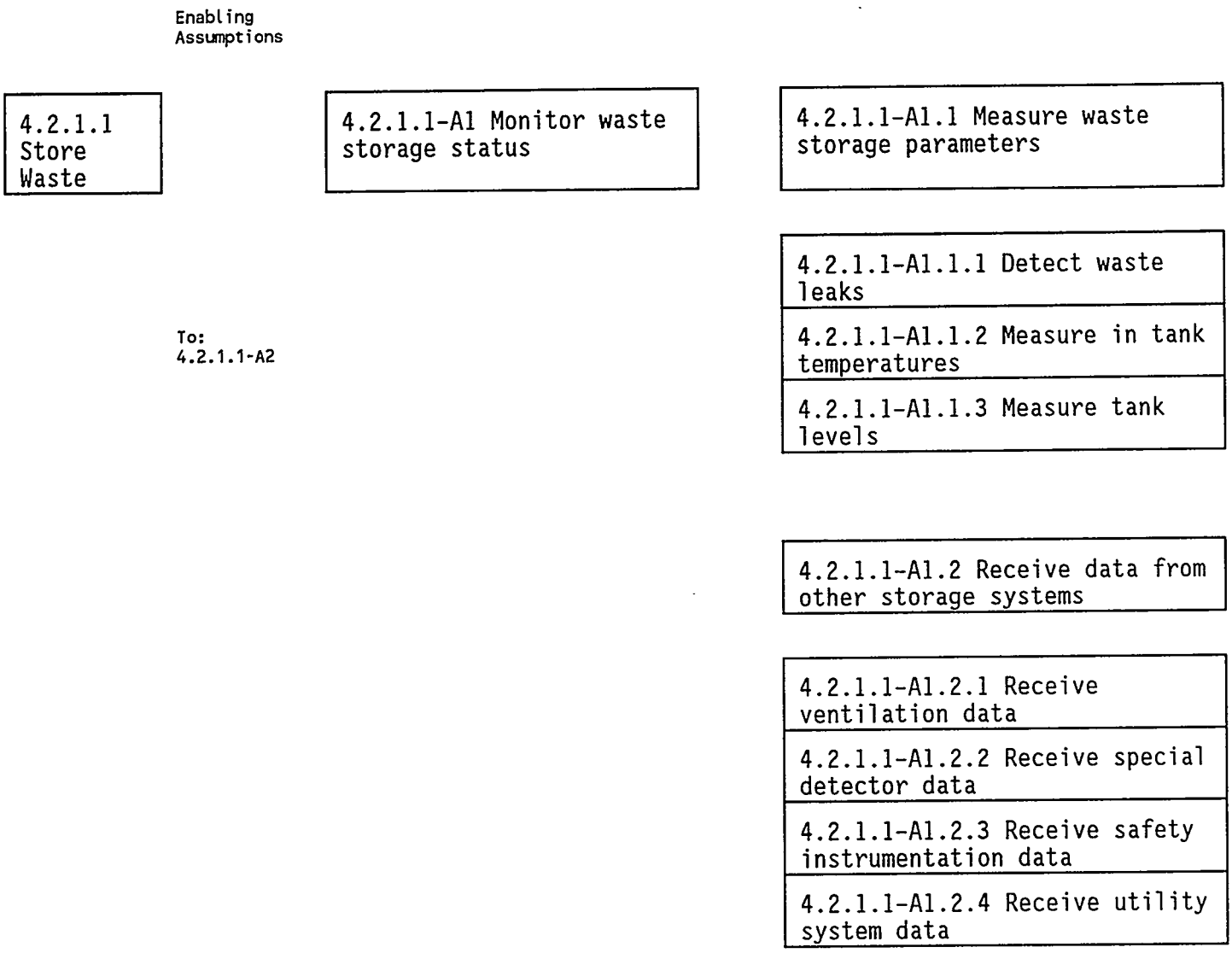
2.1 FUNCTION HIERARCHY

Each function identified for the Instrumentation Upgrade is given a number of the format 4.2.i.j-Ax or -Ax.y. The first part of the number, 4.2.i.j, is the number of the TWRS fourth-level function from which the project-level function was decomposed. The "-A" indicates that it is a function allocated to the Instrumentation Upgrade, as defined in Appendix A. The "x" or "x.y" completes the unique number within each "4.2.i.j" group. For example, 4.2.1.1-A1 indicates a function decomposed from TWRS function 4.2.1.1 and allocated to the Instrumentation Upgrade project; and 4.2.1.1-A1.1 indicates a subfunction of 4.2.1.1-A1.

Figure A2-1 illustrates the hierarchy of the Instrumentation Upgrade functions, as decomposed from the TWRS fourth-level functions. The dotted lines between the fourth-level functions and the project-level functions represent several missing levels. Those levels will be developed as the TWRS systems engineering effort continues. The Function Description Sheets in Section 2.2 of this appendix define the assumptions that enabled the decomposition of each TWRS function to the project level.

Figure 2-1 in the main body of this document shows the hierarchy of the TWRS functions to the fourth level.

FIGURE A2-1. INSTRUMENTATION UPGRADE FUNCTION HIERARCHY



4.2.1.1-A2 Manage system data

4.2.1.1-A2.1 Process data

4.2.1.1-A2.1.1 Compile database of current and trend inputs

4.2.1.1-A2.1.2 Create reports for Maintenance and Engineering interface

4.2.1.1-A2.1.3 Create reports for Management interface

4.2.1.1-A2.1.4 Create reports for offsite agencies

4.2.1.1-A2.2 Interface with Operators

4.2.1.1-A2.2.1 Display graphic system data

4.2.1.1-A2.2.2 Display graphic trend data

4.2.1.1-A2.2.3 Display interactive alarms

4.2.1.1-A2.2.4 Display interactive procedures

4.2.1.1-A2.2.5 Display interactive manuals

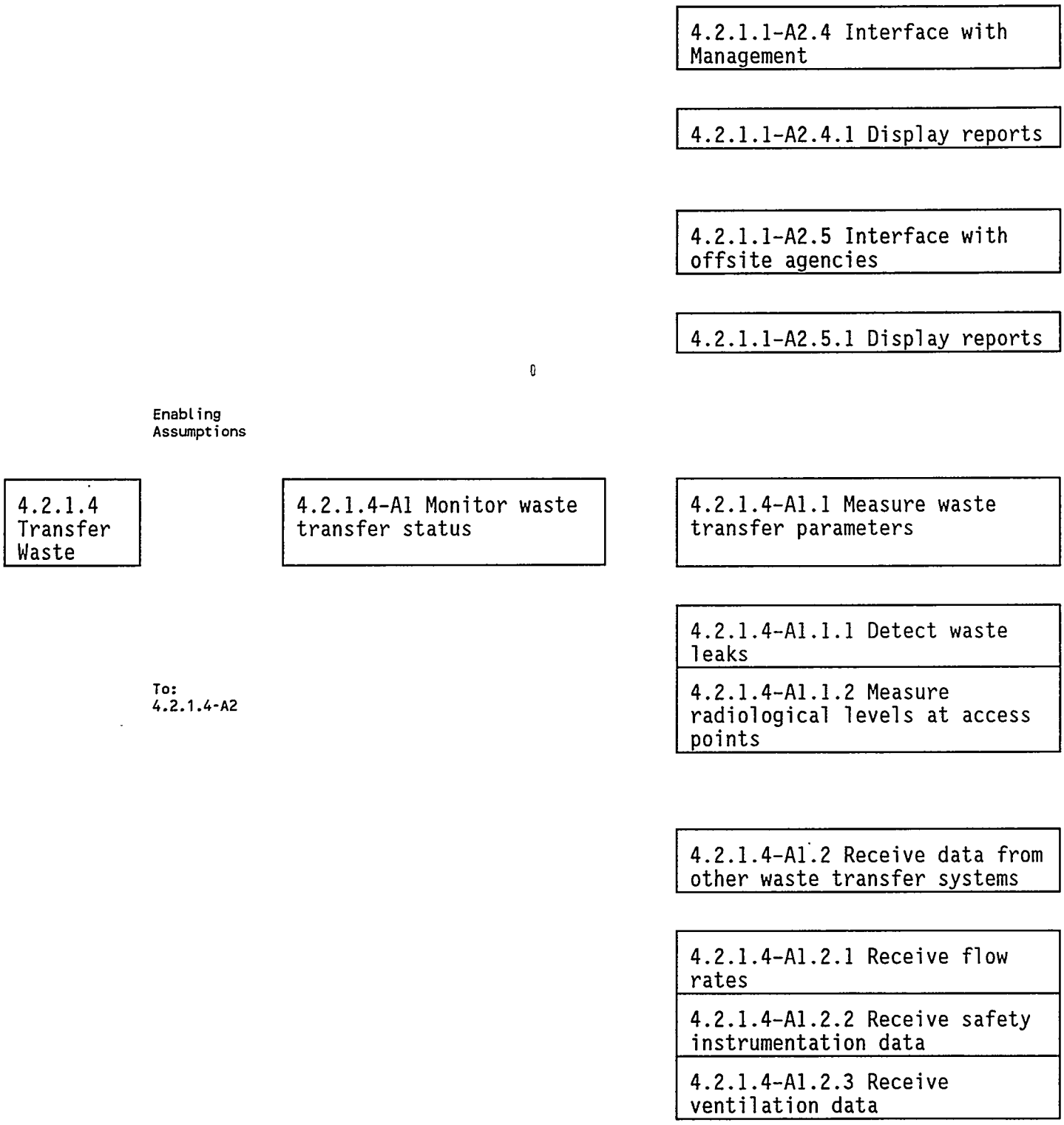
4.2.1.1-A2.3 Interface with Maintenance and Engineering

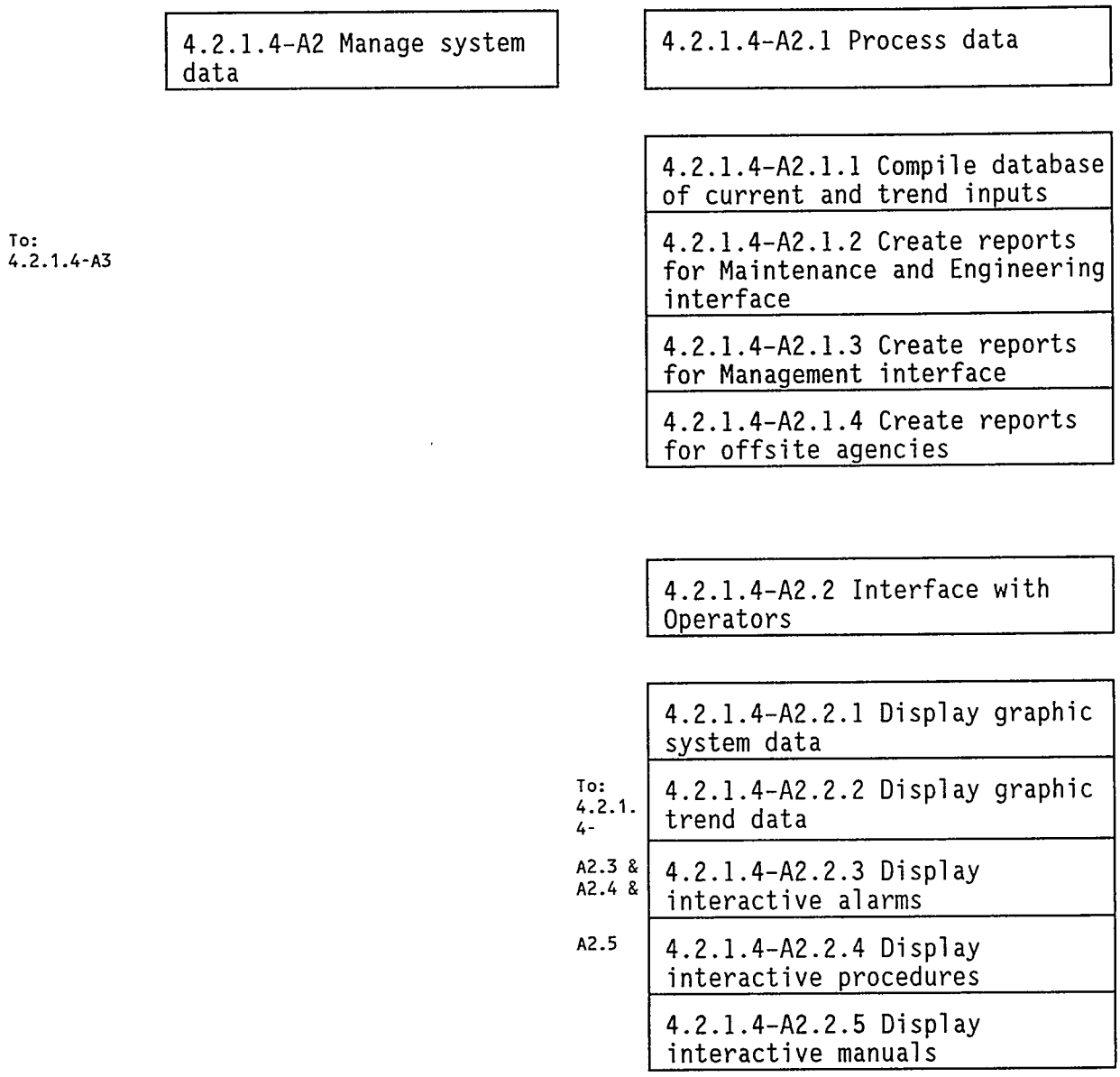
To: 4.2.1.1-A2.4& A2.5

4.2.1.1-A2.3.1 Display graphic system data

4.2.1.1-A2.3.2 Display graphic trend data

4.2.1.1-A2.3.3 Display reports


4.2.1.1-A2.4 Interface with Management
4.2.1.1-A2.4.1 Display reports
4.2.1.1-A2.5 Interface with offsite agencies
4.2.1.1-A2.5.1 Display reports
Enabling Assumptions
4.2.1.4 Transfer Waste
4.2.1.4-A1 Monitor waste transfer status
4.2.1.4-A1.1 Measure waste transfer parameters
4.2.1.4-A1.1.1 Detect waste leaks
4.2.1.4-A1.1.2 Measure radiological levels at access points
To: 4.2.1.4-A2
4.2.1.4-A1.2 Receive data from other waste transfer systems
4.2.1.4-A1.2.1 Receive flow rates
4.2.1.4-A1.2.2 Receive safety instrumentation data
4.2.1.4-A1.2.3 Receive ventilation data


4.2.1.4-A2 Manage system data
4.2.1.4-A2.1 Process data
4.2.1.4-A2.1.1 Compile database of current and trend inputs
4.2.1.4-A2.1.2 Create reports for Maintenance and Engineering interface
4.2.1.4-A2.1.3 Create reports for Management interface
4.2.1.4-A2.1.4 Create reports for offsite agencies
To: 4.2.1.4-A3
4.2.1.4-A2.2 Interface with Operators
4.2.1.4-A2.2.1 Display graphic system data
4.2.1.4-A2.2.2 Display graphic trend data
4.2.1.4-A2.2.3 Display interactive alarms
4.2.1.4-A2.2.4 Display interactive procedures
4.2.1.4-A2.2.5 Display interactive manuals
To: 4.2.1.4- A2.3 & A2.4 & A2.5

- 4.2.1.4-A2.3 Interface with Maintenance and Engineering
  - 4.2.1.4-A2.3.1 Display graphic system data
  - 4.2.1.4-A2.3.2 Display graphic trend data
  - 4.2.1.4-A2.3.3 Display reports
- 4.2.1.4-A2.4 Interface with Management
  - 4.2.1.4-A2.4.1 Display reports
- 4.2.1.4-A2.5 Interface with offsite agencies
  - 4.2.1.4-A2.5.1 Display reports

- 4.2.1.4-A3 Stop all waste transfers for any unsafe condition
  - 4.2.1.4-A3.1 Interlock pump controls to safety instrumentation
    - 4.2.1.4-A3.1.1 Receive data from local safety alarms
    - 4.2.1.4-A3.1.2 Stop pump for associated safety alarms

2.2 FUNCTION DESCRIPTION SHEETS

A Function Description Sheet is provided for each of the functions identified for the Instrumentation Upgrade. The Function Description Sheets provide function definitions, enabling assumptions, interfaces, function requirements, and interface requirements. The sheets were prepared according to the format used in DOE/RL-92-60 (Released Draft), as shown below.

I. FUNCTION ID NUMBER:

II. FUNCTION TITLE: Short description; verb followed by noun or noun phrase.

III. FUNCTION DEFINITION:

Primary statement of purpose. Brief description of what this function must accomplish to meet the overall mission, often including the scope of applicability.

IV. ENABLING ASSUMPTIONS:

Assumed interfaces, end states, and criteria that were made to further define the function, constrain the limits of applicability, or interpret system requirements. These assumptions necessitate additional analyses to determine impacts on the program.

V. INTERFACES

A. INPUTS

Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

B. OUTPUTS

Anything that leaves the function after it has been acted upon by that function.

VI. FUNCTION REQUIREMENTS

A qualitative or quantitative statement of how well a function must be performed. Function requirements may be one of two types: Constraints or Performance Requirements.

Constraints:
Requirements imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders).

Performance Requirements:
Requirements imposed upon the function by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

The numbering convention used for the identification of requirements in these tables is as follows:

4.2.1 C1 is the first constraint (C) allocated to function 4.2.1;
4.2.1 P1 is the first performance requirement (P) allocated to function 4.2.1;
4.2.1 I3 C1 is the first constraint allocated to input number I3 to function 4.2.1; and
4.2.1. O1 P1 is the first performance requirement allocated to output number O1 from function 4.2.1.

VII. INTERFACE REQUIREMENTS

A requirement that applies to the inputs to, or outputs from, a function. Interface requirements are either constraints or performance requirements.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1

II. **FUNCTION TITLE:** Monitor waste storage status

III. **FUNCTION DEFINITION:**

Collect and distribute information from instrumentation in DST farms and other waste storage facilities to meet state and federal regulations.

IV. **ENABLING ASSUMPTIONS:**

1. Existing waste will continue to be stored in existing tanks.
2. Waste tanks will continue to require operating and surveillance systems until closure.
3. Decomposition of Function 4.2.1.1 will include this fifth-level function.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1 I1 Tank Farm physical parameters From: External

Leak detection, waste temperatures, tank levels and miscellaneous system parameters. The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1 O1 Tank Farm data To: 4.2.1.1-A2

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.1

II. **FUNCTION TITLE:** Measure waste storage parameters

III. **FUNCTION DEFINITION:**

Monitor instrumentation in DST farms. Instrumentation includes, leak detection, tank temperatures and level measurement.

IV. **ENABLING ASSUMPTIONS:**

1. In-situ element measurements for monitoring system parameters are integral components of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to the Instrumentation Upgrade.

2. These are all of the required monitoring points not covered by other projects or existing instrumentation.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.1 I1 Tank Farm physical parameters From: External

Leak detection, waste temperatures and tank levels. The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1.1 O1 Tank Farm data To: 4.2.1.1-A2.1
4.2.1.1-A2.2
4.2.1.1-A2.3

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.1.1

II. **FUNCTION TITLE:** Detect waste leaks

III. **FUNCTION DEFINITION:**

Provide instrumentation to monitor for the presence of waste outside the primary containment boundaries, or accumulated liquid in the secondary containment systems.

IV. **ENABLING ASSUMPTIONS:**

1. Leak detection is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.1.1 I1 Waste liquids From: External

The waste site environment is an input to the function and is an external source.

4.2.1.1-A1.1.1 I2 Radiation From: External

The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1.1.1 O1 Leak status To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A1.1.1 O2 Liquid intrusion level To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

This is a networked data signal which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.1.2

II. **FUNCTION TITLE:** Measure in tank temperatures

III. **FUNCTION DEFINITION:**

Provide instrumentation to monitor internal temperature characteristics of waste tanks.

IV. **ENABLING ASSUMPTIONS:**

1. Tank temperature measurement is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.1.2 I1 Vapor space temperature From: External

The waste site environment is an input to the function and is an external source.

4.2.1.1-A1.1.2 I2 Liquid temperature From: External

The waste site environment is an input to the function and is an external source.

4.2.1.1-A1.1.2 I3 Saltcake/sludge temperature From: External

The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1.1.2 O1 Tank temperatures To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.1.3

II. **FUNCTION TITLE:** Measure tank levels

III. **FUNCTION DEFINITION:**

Provide instrumentation to monitor waste tank levels.

IV. **ENABLING ASSUMPTIONS:**

1. Tank level measurement is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.1.3 I1 Liquid surface level From: External

The waste site environment is an input to the function and is an external source.

4.2.1.1-A1.1.3 I2 Saltcake/sludge surface level From: External

The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1.1.3 O1 Tank levels To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.2

II. **FUNCTION TITLE:** Receive data from other storage systems

III. **FUNCTION DEFINITION:**

Monitor information acquired by other instrumentation systems in the DST farms. This information includes tank waste volume, composition, and generation schedule projections from Hanford site hazardous radioactive waste generators.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.2 I1 Waste site physical parameters From: TBD

These signals are from other systems previously installed. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2 O1 Other waste site data To: 4.2.1.1-A2.1
4.2.1.1-A2.2
4.2.1.1-A2.3

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.2.1

II. **FUNCTION TITLE:** Receive ventilation data

III. **FUNCTION DEFINITION:**

Monitor information acquired from tank ventilation systems.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.2.1 I1 Ventilation status From: TBD

Ventilation instrumentation and control status from DST ventilation systems. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2.1 O1 Ventilation data To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.2.2

II. **FUNCTION TITLE:** Receive special detector data

III. **FUNCTION DEFINITION:**

Monitor information acquired from special detectors to mitigate hazardous tank conditions and resolve safety issues.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.2.2 I1 Special detector status From: TBD

Inputs from special detectors such as gas chromatography. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2.2 O1 Special detector data To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.2.3

II. **FUNCTION TITLE:** Receive safety instrumentation data

III. **FUNCTION DEFINITION:**

Monitor information from tank safety instrumentation installed prior to this project.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.2.3 I1 Safety instrument status From: TBD

Inputs from safety devices. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2.3 O1 Safety instrument data To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A1.2.4

II. **FUNCTION TITLE:** Receive utility system data

III. **FUNCTION DEFINITION:**

Monitor information from tank farm utilities instrumentation.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe storage of hazardous radioactive waste within DST's, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A1.2.4 I1 Utilities status From: TBD

Water, electricity, compressed air or other tank farm utilities. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2.4 O1 Utilities data To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2

II. **FUNCTION TITLE:** Manage system data

III. **FUNCTION DEFINITION:**

Network data monitored in the Tank Farms and data that has been stored for trending. Process the database to create reports and interactive annunciation.

IV. **ENABLING ASSUMPTIONS:**

1. Existing waste will continue to be stored in existing tanks.
2. Waste tanks will continue to require operating and surveillance systems until closure.
3. Decomposition of Function 4.2.1.1 will include this fifth-level function.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2 I1 Tank Farm data From: 4.2.1.1-A1

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.1-A2 O1 Graphic user interface To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.1

II. **FUNCTION TITLE:** Process data

III. **FUNCTION DEFINITION:**

Store data from the network in a database and process for trending and report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.1 I1 Tank Farm data From: 4.2.1.1-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1 I2 Other waste site data From: 4.2.1.1-A1.2

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.1 O1 Historical database To: 4.2.1.1-A2.2
4.2.1.1-A2.3

This is a networked database which can be read by direct display devices.

4.2.1.1-A2.1 O2 Reports To: 4.2.1.1-A2.3
4.2.1.1-A2.4
4.2.1.1-A2.5

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.1.1

II. **FUNCTION TITLE:** Compile database of current and trend inputs

III. **FUNCTION DEFINITION:**

Acquire data from the network at a rate which will optimize operator response time to the process including credible emergencies. Compile data at a sampling rate sufficient to capture the characteristic of expected trends. The duration of trending shall be useful for measurement of system productivity and life expectancy as well as meeting waste monitoring requirements. Alarms are prioritized for display and masking attributes.

IV. **ENABLING ASSUMPTIONS:**

1. The database will be used to enhance maintenance and engineering efforts as well as meeting waste monitoring requirements.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.1.1 I1 Leak status From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I2 Liquid intrusion level From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I3 Tank temperatures From: 4.2.1.1-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I4 Tank levels From: 4.2.1.1-A1.1.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I5 Ventilation data From: 4.2.1.1-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I6 Special detector data From: 4.2.1.1-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I7 Safety instrument data From: 4.2.1.1-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.1.1 I8 Utilities data From: 4.2.1.1-A1.2.4

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.1.1 O1 Historical database To: 4.2.1.1-A2.1.2
4.2.1.1-A2.1.3
4.2.1.1-A2.1.4
4.2.1.1-A2.2.2
4.2.1.1-A2.3.2

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

4.2.1.1-A2.1.1 O2 Alarms To: 4.2.1.1-A2.2.3

Alarms both received from instrumentation and generated from system data. Both process and system trouble alarms are addressed. Alarms compiled by the data acquisition system are prioritized by type and required response. Alarms can be masked by operators.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.1.2

II. **FUNCTION TITLE:** Create reports for Maintenance and Engineering interface

III. **FUNCTION DEFINITION:**

Generate instrumentation, software and equipment reports useful for measurement of productivity and life expectancy of system components.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.1.2 I1 Historical database From: 4.2.1.1-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.1.2 O1 Reports To: 4.2.1.1-A2.3.3

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.1.3

II. **FUNCTION TITLE:** Create reports for Management interface

III. **FUNCTION DEFINITION:**

Generate documents for management reporting requirements.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.1.3 I1 Historical database From: 4.2.1.1-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.1.3 O1 Reports To: 4.2.1.1-A2.4.1

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.1.4

II. **FUNCTION TITLE:** Create reports for offsite agencies

III. **FUNCTION DEFINITION:**

Generate documents for offsite reporting requirements.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.1.4 I1 Historical database From: 4.2.1.1-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.1.4 O1 Reports To: 4.2.1.1-A2.5.1

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2

II. **FUNCTION TITLE:** Interface with Operators

III. **FUNCTION DEFINITION:**

Provide operator workstations with graphic displays of system information and interactive information systems.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2 I1 Tank Farm data From: 4.2.1.1-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2 I2 Other waste site data From: 4.2.1.1-A1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2 I3 Historical database From: 4.2.1.1-A2.1

This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.2 O1 Interactive graphic and text displays To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2.1

II. **FUNCTION TITLE:** Display graphic system data

III. **FUNCTION DEFINITION:**

Provide operators with graphic displays of all system information.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2.1 I1 Leak status From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I2 Liquid intrusion level From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I3 Tank temperatures From: 4.2.1.1-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I4 Tank levels From: 4.2.1.1-A1.1.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I5 Ventilation data From: 4.2.1.1-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I6 Special detector data From: 4.2.1.1-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I7 Safety instrument data From: 4.2.1.1-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.2.1 I8 Utilities data From: 4.2.1.1-A1.2.4

These are networked data signals which can be read by archive and direct display devices.

B. OUTPUTS

4.2.1.1-A2.2.1 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2.2

II. **FUNCTION TITLE:** Display graphic trend data

III. **FUNCTION DEFINITION:**

Provide operators with graphic trend capabilities.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2.2 I1 Historical database From: 4.2.1.1-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.2.2 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2.3

II. **FUNCTION TITLE:** Display interactive alarms

III. **FUNCTION DEFINITION:**

Alarms will be interactive with operator procedures and operating manuals.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2.3 I1 Alarms From: 4.2.1.1-A2.1.1

Alarms both received from instrumentation and generated from system data. Both process and system trouble alarms are addressed. Alarms compiled by the data acquisition system are prioritized by type and required response. Alarms can be masked by operators.

B. **OUTPUTS**

4.2.1.1-A2.2.3 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

4.2.1.1-A2.2.3 O2 Interactive document trigger To: 4.2.1.1-A2.2.4
4.2.1.1-A2.2.5

Automatic document access is offered when an associated alarm is activated on the operator workstation.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2.4

II. **FUNCTION TITLE:** Display interactive procedures

III. **FUNCTION DEFINITION:**

Procedures will be available on workstations and are cross referenced to active alarms.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.
2. A database of operator procedures will be accessible by the data management system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2.4 I1 Procedure database From: TBD

This is a networked database which can be read by direct display devices.

4.2.1.1-A2.2.4 I2 Interactive document trigger From: 4.2.1.1-A2.2.3

Automatic document access is offered when an associated alarm is activated on the operator workstation.

B. **OUTPUTS**

4.2.1.1-A2.2.4 O1 Interactive text display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.2.5

II. **FUNCTION TITLE:** Display interactive manuals

III. **FUNCTION DEFINITION:**

Manuals will be available on workstations and are cross referenced to active alarms.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.
2. A database of operator procedures will be accessible by the data management system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.2.5 I1 Manual database From: TBD

This is a networked database which can be read by direct display devices.

4.2.1.1-A2.2.5 I2 Interactive document trigger From: 4.2.1.1-A2.2.3

Automatic document access is offered when an associated alarm is activated on the operator workstation.

B. **OUTPUTS**

4.2.1.1-A2.2.5 O1 Interactive text display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.3

II. **FUNCTION TITLE:** Interface with Maintenance and Engineering

III. **FUNCTION DEFINITION:**

Graphic system data and trends will be available from the data management system for use by engineering personnel on standard IBM compatible PCs via the general user network.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.3 I1 Tank Farm data From: 4.2.1.1-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3 I2 Other waste site data From: 4.2.1.1-A1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3 I3 Historical database From: 4.2.1.1-A2.1

This is a networked database which can be read by direct display devices.

4.2.1.1-A2.3 I4 Reports From: 4.2.1.1-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.3 O1 Interactive graphic and text displays To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

4.2.1.1-A2.3 O2 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.3.1

II. **FUNCTION TITLE:** Display graphic system data

III. **FUNCTION DEFINITION:**

Provide graphic displays of system information from the recorded database.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.3.1 I1 Leak status From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I2 Liquid intrusion level From: 4.2.1.1-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I3 Tank temperatures From: 4.2.1.1-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I4 Tank levels From: 4.2.1.1-A1.1.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I5 Ventilation data From: 4.2.1.1-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I6 Special detector data From: 4.2.1.1-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I7 Safety instrument data From: 4.2.1.1-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

4.2.1.1-A2.3.1 I8 Utilities data From: 4.2.1.1-A1.2.4

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.3.1 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.3.2

II. **FUNCTION TITLE:** Display graphic trend data

III. **FUNCTION DEFINITION:**

Provide graphic trend capabilities for system information from the recorded database.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.3.2 I1 Historical database From: 4.2.1.1-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.1-A2.3.2 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.3.3

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system that allows custom report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.3.3 I1 Reports From: 4.2.1.1-A2.1.2

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.3.3 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.4

II. **FUNCTION TITLE:** Interface with Management

III. **FUNCTION DEFINITION:**

Custom reports will be available from the data management system for use by management on standard IBM compatible PCs via the general user network.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.4 I1 Reports From: 4.2.1.1-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.4 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.4.1

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system that allows custom report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.4.1 I1 Reports From: 4.2.1.1-A2.1.3

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.4.1 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.5

II. **FUNCTION TITLE:** Interface with offsite agencies

III. **FUNCTION DEFINITION:**

Reports generated by the data management system will be available offsite in a read only communication protocol.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.5 I1 Reports From: 4.2.1.1-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.5 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-A2.5.1

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system in a read only communication protocol.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-A2.5.1 I1 Reports From: 4.2.1.1-A2.1.4

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.1-A2.5.1 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1

II. **FUNCTION TITLE:** Monitor waste transfer status

III. **FUNCTION DEFINITION:**

Collect and distribute information from instrumentation in waste transfer facilities to meet state and federal regulations.

IV. **ENABLING ASSUMPTIONS:**

1. Waste receiver facilities and piping will be installed as an integral part of the transfer system.
2. Decomposition of Function 4.2.1.4 will include this fifth-level function.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1 I1 Waste transfer physical parameters From: External

Leak detection, access radiological levels and miscellaneous system parameters. The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.4-A1 O1 Waste transfer data To: 4.2.1.4-A2
4.2.1.4-A3

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.1

II. **FUNCTION TITLE:** Measure waste transfer parameters

III. **FUNCTION DEFINITION:**

Monitor instrumentation in the waste transfer system. Instrumentation includes, leak detection and radiological levels.

IV. **ENABLING ASSUMPTIONS:**

1. In-situ element measurements for monitoring system parameters are integral components of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to the Instrumentation Upgrade.

2. These are all of the required monitoring points not covered by other projects or existing instrumentation.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.1 I1 Waste transfer physical parameters From: External

Leak detection and radiation detection. The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.1-A1.1 O1 Waste transfer data To: 4.2.1.4-A2.1, 4.2.1.4-A2.2, 4.2.1.4-A2.3, 4.2.1.4-A3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table 2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table 2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.1.1

II. **FUNCTION TITLE:** Detect waste leaks

III. **FUNCTION DEFINITION:**

Provide instrumentation to monitor for the presence of waste outside the primary containment boundaries, or accumulated liquid in the secondary containment systems.

IV. **ENABLING ASSUMPTIONS:**

1. Leak detection is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.1.1 I1 Waste liquids From: External

The waste site environment is an input to the function and is an external source.

4.2.1.4-A1.1.1 I2 Radiation From: External

The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.4-A1.1.1 O1 Leak status To: 4.2.1.4-A2.1.1, 4.2.1.4-A2.2.1, 4.2.1.4-A2.3.1, 4.2.1.4-A3.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.1-A1.1.1 O2 Liquid intrusion level To: 4.2.1.4-A2.1.1, 4.2.1.4-A2.2.1, 4.2.1.4-A2.3.1

This is a networked data signal which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.1.2

II. **FUNCTION TITLE:** Measure radiological levels at access points

III. **FUNCTION DEFINITION:**

Provide instrumentation to monitor for the presence of radiation at waste transfer piping access points.

IV. **ENABLING ASSUMPTIONS:**

1. Radiological measurement is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.1.2 I1 Radiation From: External

The waste site environment is an input to the function and is an external source.

B. **OUTPUTS**

4.2.1.4-A1.1.2 O1 Radiological levels To: 4.2.1.4-A2.1.1
4.2.1.4-A2.2.1
4.2.1.4-A2.3.1
4.2.1.4-A3.1.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.2

II. **FUNCTION TITLE:** Receive data from other waste transfer systems

III. **FUNCTION DEFINITION:**

Monitor information acquired by other instrumentation systems in the waste transfer system. This information includes flow rates, safety instrumentation and ventilation system data.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.2 I1 Waste site physical parameters From: TBD

These signals are from other systems previously installed. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.4-A1.2 O1 Other waste site data To: 4.2.1.4-A2.1
4.2.1.4-A2.2
4.2.1.4-A2.3
4.2.1.4-A3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.2.1

II. **FUNCTION TITLE:** Receive flow rates

III. **FUNCTION DEFINITION:**

Monitor information acquired from waste transfer flow meters.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.2.1 I1 Waste flow rate data From: TBD

Flow data acquired from existing equipment on the waste transfer system. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.4-A1.2.1 O1 Flow rate data To: 4.2.1.4-A2.1.1
4.2.1.4-A2.2.1
4.2.1.4-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.2.2

II. **FUNCTION TITLE:** Receive safety instrumentation data

III. **FUNCTION DEFINITION:**

Monitor information acquired from safety instrumentation to resolve safety issues.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.2.2 I1 Safety instrument status From: TBD

Inputs from existing safety instrumentation. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.1-A1.2.2 O1 Safety instrument data To: 4.2.1.1-A2.1.1
4.2.1.1-A2.2.1
4.2.1.1-A2.3.1
4.2.1.1-A3.1.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A1.2.3

II. **FUNCTION TITLE:** Receive ventilation data

III. **FUNCTION DEFINITION:**

Monitor information acquired from ventilation systems.

IV. **ENABLING ASSUMPTIONS:**

1. Monitoring all relevant system parameters is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

2. Catch Tanks and DCRTs are isolated.

3. The waste transfer facilities installed by this project have ventilation requirements.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A1.2.3 I1 Ventilation status From: TBD

Ventilation instrumentation and control status from Ventilation System Upgrade. These signals will be further defined for inclusion here by conceptual design efforts.

B. **OUTPUTS**

4.2.1.4-A1.2.3 O1 Ventilation data To: 4.2.1.4-A2.1.1
4.2.1.4-A2.2.1
4.2.1.4-A2.3.1

These are networked data signals which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2

II. **FUNCTION TITLE:** Manage system data

III. **FUNCTION DEFINITION:**

Network data monitored in the waste transfer system and data that has been stored for trending. Process the database to create reports and interactive annunciation.

IV. **ENABLING ASSUMPTIONS:**

1. Waste receiver facilities and piping will be installed as an integral part of the transfer system.
2. Decomposition of Function 4.2.1.4 will include this fifth-level function.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2 I1 Waste transfer data From: 4.2.1.4-A1

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A2 O1 Graphic user interface To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.1

II. **FUNCTION TITLE:** Process data

III. **FUNCTION DEFINITION:**

Store data from the network in a database and process for trending and report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.1 I1 Waste transfer data From: 4.2.1.4-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.1 I2 Other waste site data From: 4.2.1.4-A1.2

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.1 O1 Historical database To: 4.2.1.4-A2.2
4.2.1.4-A2.3

This is a networked database which can be read by direct display devices.

4.2.1.4-A2.1 O2 Reports To: 4.2.1.4-A2.3
4.2.1.4-A2.4
4.2.1.4-A2.5

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.1.1

II. **FUNCTION TITLE:** Compile database of current and trend inputs

III. **FUNCTION DEFINITION:**

Acquire data from the network at a rate which will optimize operator response time to the process including credible emergencies. Compile data at a sampling rate sufficient to capture the characteristic of expected trends. The duration of trending shall be useful for measurement of system productivity and life expectancy as well as meeting waste monitoring requirements. Alarms are prioritized for display and masking attributes.

IV. **ENABLING ASSUMPTIONS:**

1. The database will be used to enhance maintenance and engineering efforts as well as meeting waste monitoring requirements.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.1.1 I1 Leak status From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.1.1 I2 Liquid intrusion level From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.1.1 I3 Radiological levels From: 4.2.1.4-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.1.1 I4 Flow rate data From: 4.2.1.4-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.1.1 I5 Safety instrument data From: 4.2.1.4-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.1.1 I6 Ventilation data From: 4.2.1.4-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

B. OUTPUTS

4.2.1.4-A2.1.1 01 Historical database To: 4.2.1.4-A2.1.2
4.2.1.4-A2.1.3
4.2.1.4-A2.1.4
4.2.1.4-A2.2.2
4.2.1.4-A2.3.2

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

4.2.1.4-A2.1.1 02 Alarms To: 4.2.1.4-A2.2.3

Alarms both received from instrumentation and generated from system data. Both process and system trouble alarms are addressed. Alarms compiled by the data acquisition system are prioritized by type and required response. Alarms can be masked by operators.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.1.2

II. **FUNCTION TITLE:** Create reports for Maintenance and Engineering interface

III. **FUNCTION DEFINITION:**

Generate instrumentation, software and equipment reports useful for measurement of productivity and life expectancy of system components.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.1.2 I1 Historical database From: 4.2.1.4-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.1.2 O1 Reports To: 4.2.1.4-A2.3.3

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.1.3

II. **FUNCTION TITLE:** Create reports for Management interface

III. **FUNCTION DEFINITION:**

Generate documents for management reporting requirements.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.1.3 I1 Historical database From: 4.2.1.4-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.1.3 O1 Reports To: 4.2.1.4-A2.4.1

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.1.4

II. **FUNCTION TITLE:** Create reports for offsite agencies

III. **FUNCTION DEFINITION:**

Generate documents for offsite reporting requirements.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.1.4 I1 Historical database From: 4.2.1.4-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.1.4 O1 Reports To: 4.2.1.4-A2.5.1

Reports generated by the data management system are accessible on the general user network.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2

II. **FUNCTION TITLE:** Interface with Operators

III. **FUNCTION DEFINITION:**

Provide operator workstations with graphic displays of system information and interactive information systems.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2 I1 Waste transfer data From: 4.2.1.4-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.2 I2 Other waste site data From: 4.2.1.4-A1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.2 I3 Historical database From: 4.2.1.4-A2.1

This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.2 O1 Interactive graphic and text displays To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2.1

II. **FUNCTION TITLE:** Display graphic system data

III. **FUNCTION DEFINITION:**

Provide operators with graphic displays of all system information.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2.1 I1 Leak status From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.2.1 I2 Liquid intrusion level From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.2.1 I3 Radiological levels From: 4.2.1.4-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.2.1 I4 Flow rate data From: 4.2.1.4-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.2.1 I5 Safety instrument data From: 4.2.1.4-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.2.1 I6 Ventilation data From: 4.2.1.4-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.2.1 01 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2.2

II. **FUNCTION TITLE:** Display graphic trend data

III. **FUNCTION DEFINITION:**

Provide operators with graphic trend capabilities.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2.2 I1 Historical database From: 4.2.1.4-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.2.2 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2.3

II. **FUNCTION TITLE:** Display interactive alarms

III. **FUNCTION DEFINITION:**

Alarms will be interactive with operator procedures and operating manuals.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2.3 I1 Alarms From: 4.2.1.4-A2.1.1

Alarms both received from instrumentation and generated from system data. Both process and system trouble alarms are addressed. Alarms compiled by the data acquisition system are prioritized by type and required response. Alarms can be masked by operators.

B. **OUTPUTS**

4.2.1.4-A2.2.3 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

4.2.1.4-A2.2.3 O2 Interactive document trigger To:
4.2.1.4-A2.2.4
4.2.1.4-A2.2.5

Automatic document access is offered when an associated alarm is activated on the operator workstation.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2.4

II. **FUNCTION TITLE:** Display interactive procedures

III. **FUNCTION DEFINITION:**

Procedures will be available on workstations and are cross referenced to active alarms.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.
2. A database of operator procedures will be accessible by the data management system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2.4 I1 Procedure database From: TBD

This is a networked database which can be read by direct display devices.

4.2.1.4-A2.2.4 I2 Interactive document trigger From: 4.2.1.4-A2.2.3

Automatic document access is offered when an associated alarm is activated on the operator workstation.

B. **OUTPUTS**

4.2.1.4-A2.2.4 O1 Interactive text display To: External

Automatic document access is offered when an associated alarm is activated on the operator workstation. This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.2.5

II. **FUNCTION TITLE:** Display interactive manuals

III. **FUNCTION DEFINITION:**

Manuals will be available on workstations and are cross referenced to active alarms.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.
2. A database of operator procedures will be accessible by the data management system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.2.5 I1 Manual database From: TBD

This is a networked database which can be read by direct display devices.

4.2.1.4-A2.2.5 I2 Interactive document trigger From: 4.2.1.4-A2.2.3

Automatic document access is offered when an associated alarm is activated on the operator workstation.

B. **OUTPUTS**

4.2.1.4-A2.2.5 O1 Interactive text display To: External

Automatic document access is offered when an associated alarm is activated on the operator workstation. This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.3

II. **FUNCTION TITLE:** Interface with Maintenance and Engineering

III. **FUNCTION DEFINITION:**

Graphic system data and trends will be available from the data management system for use by engineering personnel on standard IBM compatible PCs via the general user network.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.3 I1 Waste transfer data From: 4.2.1.4-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.3 I2 Other waste site data From: 4.2.1.4-A1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.3 I3 Historical database From: 4.2.1.4-A2.1

This is a networked database which can be read by direct display devices.

4.2.1.4-A2.3 I4 Reports From: 4.2.1.4-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.3 O1 Interactive graphic and text displays To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

4.2.1.4-A2.3 O2 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.3.1

II. **FUNCTION TITLE:** Display graphic system data

III. **FUNCTION DEFINITION:**

Provide graphic displays of system information from the recorded database.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.3.1 I1 Leak status From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.3.1 I2 Liquid intrusion level From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A2.3.1 I3 Radiological levels From: 4.2.1.4-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.3.1 I4 Flow rate data From: 4.2.1.4-A1.2.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.3.1 I5 Safety instrument data From: 4.2.1.4-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A2.3.1 I6 Ventilation data From: 4.2.1.4-A1.2.3

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.3.1 01 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. FUNCTION REQUIREMENTS

See Table A2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.3.2

II. **FUNCTION TITLE:** Display graphic trend data

III. **FUNCTION DEFINITION:**

Provide graphic trend capabilities for system information from the recorded database.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.3.2 I1 Historical database From: 4.2.1.4-A2.1.1

Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.

B. **OUTPUTS**

4.2.1.4-A2.3.2 O1 Interactive graphic display To: External

This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.3.3

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system that allows custom report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.3.3 I1 Reports From: 4.2.1.4-A2.1.2

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.3.3 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.4

II. **FUNCTION TITLE:** Interface with Management

III. **FUNCTION DEFINITION:**

Custom reports will be available from the data management system for use by management on standard IBM compatible PCs via the general user network

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.4 I1 Reports From: 4.2.1.4-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.4 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.4.1

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system that allows custom report generation.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.4.1 I1 Reports From: 4.2.1.4-A2.1.3

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.4.1 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.5

II. **FUNCTION TITLE:** Interface with offsite agencies

III. **FUNCTION DEFINITION:**

Reports generated by the data management system will be available offsite in a read only communication protocol.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.5 I1 Reports From: 4.2.1.4-A2.1

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.5 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A2.5.1

II. **FUNCTION TITLE:** Display reports

III. **FUNCTION DEFINITION:**

Provide access to the recorded database through a data management system in a read only communication protocol.

IV. **ENABLING ASSUMPTIONS:**

1. This function is an integral part of monitoring and display functions, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A2.5.1 I1 Reports From: 4.2.1.4-A2.1.4

Reports generated by the data management system are accessible on the general user network.

B. **OUTPUTS**

4.2.1.4-A2.5.1 O1 Display reports To: External

The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A3

II. **FUNCTION TITLE:** Stop all waste transfers for any unsafe condition

III. **FUNCTION DEFINITION:**

The master pump shutdown system will stop waste transfers along any route which has an alarm in annunciation.

IV. **ENABLING ASSUMPTIONS:**

1. Waste receiver facilities and piping will be installed as an integral part of the transfer system.

2. Decomposition of Function 4.2.1.4 will include this fifth-level function.

3. All existing inputs to the MPS that are still relevant will be available to the new MPS system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A3 I1 Waste transfer data From: 4.2.1.4-A1

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A3 O1 Stop waste transfer To: TBD

This is a networked data signal. It will shut down the waste transfers associated to the trigger alarm.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A3.1

II. **FUNCTION TITLE:** Interlock pump controls to safety instrumentation

III. **FUNCTION DEFINITION:**

Safety related instrumentation will be interlocked with the master pump shutdown system.

IV. **ENABLING ASSUMPTIONS:**

1. A waste transfer shutdown system is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A3.1 I1 Waste transfer data From: 4.2.1.4-A1.1

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A3.1 I2 Other waste site data From: 4.2.1.4-A1.2

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A3.1 O1 Stop waste transfer To: TBD

This is a networked data signal. It will shut down the waste transfers associated to the trigger alarm.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A3.1.1

II. **FUNCTION TITLE:** Receive data from local safety alarms

III. **FUNCTION DEFINITION:**

Monitor information acquired from safety instrumentation.

IV. **ENABLING ASSUMPTIONS:**

1. A waste transfer shutdown system is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A3.1.1 I1 Leak status From: 4.2.1.4-A1.1.1

This is a networked data signal which can be read by archive and direct display devices.

4.2.1.4-A3.1.1 I2 Radiological levels From: 4.2.1.4-A1.1.2

These are networked data signals which can be read by archive and direct display devices.

4.2.1.4-A3.1.1 I3 Safety instrument data From: 4.2.1.4-A1.2.2

These are networked data signals which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A3.1.1 O1 Pump control signal To: 4.2.1.4-A3.1.2

This is a networked data signal which can be read by archive and direct display devices.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-A3.1.2

II. **FUNCTION TITLE:** Stop pump for associated safety alarms

III. **FUNCTION DEFINITION:**

Place the waste transfer system into a safe configuration based on the alarm information received.

IV. **ENABLING ASSUMPTIONS:**

1. A waste transfer shutdown system is an integral part of environmentally sound, safe transfer of hazardous radioactive waste, and is a function allocated to Instrumentation Upgrade.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-A3.1.2 I1 Pump control signal From: 4.2.1.4-A3.1.1

This is a networked data signal which can be read by archive and direct display devices.

B. **OUTPUTS**

4.2.1.4-A3.1.2 O1 Stop waste transfer To: TBD

This is a networked data signal. It will shut down the waste transfers associated to the trigger alarm.

VI. **FUNCTION REQUIREMENTS**

See Table A2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table A2-2 for requirements allocated to the interfaces of this function.

2.3 INTERFACE IDENTIFICATION

Table A2-1 below lists the interfaces of Instrumentation Upgrade functions. Interfaces are inputs and outputs of functions. An input is defined as anything that is acted upon by a function to produce desired outputs; an output is anything that leaves a function after it has been acted upon by that function. Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades become available.

NOTE: Functions designated TWRS 4.2.x.x (for example, TWRS 4.2.1.1) are fourth-level functions from DOE/RL-92-60 (Released Draft). See Figure 2-1, in the main body of this document, for the TWRS function hierarchy.

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Tank Farm physical parameters Leak detection, waste temperatures, tank levels and miscellaneous system parameters. The waste site environment is an input to the function and is an external source.	External External	4.2.1.1-A1 4.2.1.1-A1.1
Tank Farm data These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1 4.2.1.1-A1.1	4.2.1.1-A2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3
Waste liquids The waste site environment is an input to the function and is an external source.	External External	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1
Radiation The waste site environment is an input to the function and is an external source.	External External External	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2
Leak status This is a networked data signal which can be read by archive and direct display devices.	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1 4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1 4.2.1.4-A3.1.1

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Liquid intrusion level This is a networked data signal which can be read by archive and direct display devices.	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1 4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1
Vapor space temperature The waste site environment is an input to the function and is an external source.	External	4.2.1.1-A1.1.2
Liquid temperature The waste site environment is an input to the function and is an external source.	External	4.2.1.1-A1.1.2
Saltcake/sludge temperature The waste site environment is an input to the function and is an external source.	External External	4.2.1.1-A1.1.2 4.2.1.1-A1.1.3
Tank temperatures These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.1.2	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1
Liquid surface levels The waste site environment is an input to the function and is an external source.	External	4.2.1.1-A1.1.3
Tank levels These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.1.3	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1
Waste site physical parameters These signals are from other systems previously installed. These signals will be further defined for inclusion here by conceptual design efforts.	TBD TBD	4.2.1.1-A1.2 4.2.1.4-A1.2

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Other waste site data To: These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.2 4.2.1.4-A1.2	4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A3.1
Ventilation status Ventilation instrumentation and control status from Ventilation System Upgrade. These signals will be further defined for inclusion here by conceptual design efforts.	TBD TBD	4.2.1.1-A1.2.1 4.2.1.4-A1.2.3
Ventilation data These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.2.1 4.2.1.4-A1.2.3	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1 4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1
Special detector status Inputs from special detectors such as gas chromatography. These signals will be further defined for inclusion here by conceptual design efforts.	TBD	4.2.1.1-A1.2.2
Special detector data These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.2.2	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1
Safety instrument status Inputs from safety devices. These signals will be further defined for inclusion here by conceptual design efforts.	TBD TBD	4.2.1.1-A1.2.3 4.2.1.4-A1.2.2
Safety instrument data These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.2.3 4.2.1.4-A1.2.2	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1 4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1 4.2.1.4-A3.1.1

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Utilities status Water, electricity, compressed air or other tank farm utilities. These signals will be further defined for inclusion here by conceptual design efforts.	TBD	4.2.1.1-A1.2.4
Utilities data These are networked data signals which can be read by archive and direct display devices.	4.2.1.1-A1.2.4	4.2.1.1-A2.1.1 4.2.1.1-A2.2.1 4.2.1.1-A2.3.1
Graphic user interface This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.	4.2.1.1-A2 4.2.1.4-A2	External External
Historical database Historical information accessible by the data acquisition system and data management system. This is a networked database which can be read by direct display devices.	4.2.1.1-A2.1 4.2.1.1-A2.1.1 4.2.1.4-A2.1 4.2.1.4-A2.1.1	4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.1.2 4.2.1.1-A2.1.3 4.2.1.1-A2.1.4 4.2.1.1-A2.2.2 4.2.1.1-A2.3.2 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.1.2 4.2.1.4-A2.1.3 4.2.1.4-A2.1.4 4.2.1.4-A2.2.2 4.2.1.4-A2.3.2

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Reports Reports generated by the data management system are accessible on the general user network.	4.2.1.1-A2.1 4.2.1.1-A2.1.2 4.2.1.1-A2.1.3 4.2.1.1-A2.1.4 4.2.1.4-A2.1 4.2.1.4-A2.1.2 4.2.1.4-A2.1.3 4.2.1.4-A2.1.4	4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.1-A2.3.3 4.2.1.1-A2.4.1 4.2.1.1-A2.5.1 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A2.3.3 4.2.1.4-A2.4.1 4.2.1.4-A2.5.1
Alarms Alarms both received from instrumentation and generated from system data. Both process and system trouble alarms are addressed. Alarms compiled by the data acquisition system are prioritized by type and required response. Alarms can be masked by operators.	4.2.1.1-A2.1.1 4.2.1.4-A2.1.1	4.2.1.1-A2.2.3 4.2.1.4-A2.2.3
Interactive graphic and text displays This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.	4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.4-A2.2 4.2.1.4-A2.3	External External External External
Interactive graphic display This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.	4.2.1.1-A2.2.1 4.2.1.1-A2.2.2 4.2.1.1-A2.2.3 4.2.1.1-A2.3.1 4.2.1.1-A2.3.2 4.2.1.4-A2.2.1 4.2.1.4-A2.2.2 4.2.1.4-A2.2.3 4.2.1.4-A2.3.1 4.2.1.4-A2.3.2	External External External External External External External External External External
Interactive document trigger Automatic document access is offered when an associated alarm is activated on the operator workstation.	4.2.1.1-A2.2.3 4.2.1.4-A2.2.3	4.2.1.1-A2.2.4 4.2.1.1-A2.2.5 4.2.1.4-A2.2.4 4.2.1.4-A2.2.5

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Procedure database This is a networked database which can be read by direct display devices.	TBD TBD	4.2.1.1-A2.2.4 4.2.1.4-A2.2.4
Manual database This is a networked database which can be read by direct display devices.	TBD TBD	4.2.1.1-A2.2.5 4.2.1.4-A2.2.5
Interactive text display This is a man-machine interface with direct access to data from the system network as well as historical information in the data management system database.	4.2.1.1-A2.2.4 4.2.1.4-A2.2.4 4.2.1.4-A2.2.5	External External External
Display reports The report will be read by standard PC computers with standard software. This is a networked data signal which can be read by archive and direct display devices.	4.2.1.1-A2.3 4.2.1.1-A2.3.3 4.2.1.1-A2.4 4.2.1.1-A2.4.1 4.2.1.1-A2.5 4.2.1.1-A2.5.1 4.2.1.4-A2.3 4.2.1.4-A2.3.3 4.2.1.4-A2.4 4.2.1.4-A2.4.1 4.2.1.4-A2.5 4.2.1.4-A2.5.1	External External External External External External External External External External External External
Waste transfer physical parameters Leak detection, access radiological levels and miscellaneous system parameters. The waste site environment is an input to the function and is an external source.	External External	4.2.1.4-A1 4.2.1.4-A1.1
Waste transfer data These are networked data signals which can be read by archive and direct display devices.	4.2.1.4-A1 4.2.1.4-A1.1	4.2.1.4-A2 4.2.1.4-A3 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A3.1
Radiological levels These are networked data signals which can be read by archive and direct display devices.	4.2.1.4-A1.1.2	4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1 4.2.1.4-A3.1.1

TABLE A2-1. INSTRUMENTATION UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Waste flow rate data Flow data acquired from existing equipment on the waste transfer system. These signals will be further defined for inclusion here by conceptual design efforts.	TBD	4.2.1.4-A1.2.1
Flow rate data These are networked data signals which can be read by archive and direct display devices.	4.2.1.4-A1.2.1	4.2.1.4-A2.1.1 4.2.1.4-A2.2.1 4.2.1.4-A2.3.1
Stop waste transfer This is a networked data signal. It will shut down the waste transfers associated to the trigger alarm.	4.2.1.4-A3 4.2.1.4-A3.1 4.2.1.4-A3.1.2	TBD TBD TBD
Pump control signal This is a networked data signal which can be read by archive and direct display devices.	4.2.1.4-A3.1.1	4.2.1.4-A3.1.2

2.4 FUNCTIONAL AND INTERFACE REQUIREMENTS ALLOCATION

Table A2-2 below lists the constraints that are allocated to the functions and interfaces of the Instrumentation Upgrade. Performance requirements will be included in a future revision of this document.

See Section 3.0 in the main body of this document for additional instructions regarding the application of the requirements listed below.

The table also lists the source(s) for each requirement, according to the following key:

S/RID	Tank Farm Standards/Requirements Identification Document, High Level Waste Storage Tank Farms
S/RID-C	S/RID, Functional Area "Construction"
S/RID-CM	S/RID, Functional Area "Configuration Management"
S/RID-ED	S/RID, Functional Area "Engineering Design"
S/RID-EP	S/RID, Functional Area "Environmental Protection"
S/RID-ER&WM	S/RID, Functional Area "Environmental Restoration and Waste Management"
S/RID-FP	S/RID, Functional Area "Fire Protection"
S/RID-M	S/RID, Functional Area "Maintenance"
S/RID-MS	S/RID, Functional Area "Management Systems"
S/RID-NS	S/RID, Functional Area "Nuclear Safety"
S/RID-O	S/RID, Functional Area "Operations"
S/RID-QA	S/RID, Functional Area "Quality Assurance"
S/RID-RP	S/RID, Functional Area "Radiological Protection"
TWRS 4.2.x.x	Fourth-level function to which the requirement is allocated, per DOE/RL-92-60 (Released Draft)

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
5 CFR 1320, *Paperwork Reduction Act*	4.2.1.1-A2 4.2.1.4-A2	Graphic user interface Interactive text display Interactive graphic and text displays Reports Interactive graphic displays Display reports	DOE Order 1332.1A
10 CFR 20, *Standards for Protection Against Radiation*	4.2.1.1-A1 4.2.1.1-A4	Tank farm data Radiation Radiological levels Safety instrumentation data	S/RID-RP WHC-CM-1-6
10 CFR 835, *Radiation Protection for Occupational Workers*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Radiation Radiological levels Reports Safety Instrument data Alarms	WHC-CM-1-6
29 CFR 1910, *Occupational Safety and Health Standards*	4.2.1.1	Safety Instrument data Reports Tank Farm data	TWRS 4.2.1.1
40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*	4.2.1.1-A1.1.1 4.2.1.4-A2.1.1	Other waste site data	S/RID-EP TWRS 4.2.1.1
40 CFR 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Leak status Waste transfer data Radiation Radiological levels	S/RID-EP S/RID-ER&WM

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
40 CFR 265, *Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*	4.2.1.1-A1 4.2.1.1-A1.1 4.2.1.1-A1.1.1 4.2.1.1-A2.1.2	Tank farm data Leak status Liquid intrusion level Tank temperatures Tank levels	S/RIDS-EP S/RID-ER&WM
40 CFR 268, *Land Disposal Restrictions*	4.2.1.4-A1 4.2.1.1-A1.1.2	Waste transfer data Tank Temperatures	TWRS 4.2.1.4
ANSI/IEEE-498, *Standard Requirements for the Calibration and Control of Measuring and Test Equipment Used in Nuclear Facilities (1985)*	4.2.1.1-A1.1 4.2.1.4-A1.1	Liquid intrusion level Leak status Radiological level Tank temperatures	S/RID-C
DOD, MIL-STD-1472d, *Human Engineering Design Criteria for Military Systems, Equipment, and Facilities*	4.2.1.1-A2 4.2.1.4-A2	Interface with operators Display interactive alarms Interactive graphic display Interactive text display Interactive document trigger Graphic user interface Alarms Display reports	DOE Order 6430.1a Section 1300 DOE Order 5480.19
DOE/EH-0135, *Performance Objectives and Criteria for Technical Safety Appraisals at DOE Facilities and Sites*	4.1.1.1 4.2.1.4	N/A	S/RID-C S/RID-ED S/RID-MS S/RID-QA
DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Tank farm data Leak status Ventilation status Radiation Radiological levels	S/RID-EP

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
DOE/EH-0256, *Radiation Control Manual*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Radiation Radiological levels Reports Safety Instrument data Alarms	WHC-CM-1-6
DOE/EP-0108, *Standard of Fire Protection of DOE Electronic Computer/Data Processing Systems*	4.2.1.1-A1.2.3 4.2.1.4-A1.2.2	Alarms Safety instrument data	RLID 5480.7
DOE/EV-1830-T5, *A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Radiation Radiological levels Safety instrument data Alarms	DOE Order 5480.11
DOE Order 1324.2A, *Records Disposition*	4.2.1.1-A2.1.1 4.2.1.1-A2.1.2 4.2.1.1-A2.1.3 4.2.1.1-A2.1.4 4.2.1.1-A2.3.3 4.2.1.1-A2.4.1 4.2.1.1-A2.5.1 4.2.1.4-A2.1.2 4.2.1.4-A2.1.3 4.2.1.4-A2.1.4 4.2.1.4-A2.3.3 4.2.1.4-A2.4.1 4.2.1.4-A2.5.1	Historical database Safety instrument data Reports Other waste site data Procedure database Manual database Tank farm data Waste transfer data Flow rate data	S/RID-MS WHC-CM-1-6
DOE Order 1324.5A, *Records Management Program*	4.2.1.1-A2.1.1 4.2.1.1-A2.1.2 4.2.1.1-A2.1.3 4.2.1.1-A2.1.4 4.2.1.1-A2.3.3 4.2.1.1-A2.4.1 4.2.1.1-A2.5.1 4.2.1.4-A2.1.2 4.2.1.4-A2.1.3 4.2.1.4-A2.1.4 4.2.1.4-A2.3.3 4.2.1.4-A2.4.1 4.2.1.4-A2.5.1	Historical database Safety instrument data Reports Other waste site data Procedure database Manual database Tank farm data Waste transfer data Flow rate data	S/RID-MS

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
DOE Order 1330.1D, *Computer Software Management*	4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A1.2 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A3.1	N/A	N/A
DOE Order 1360.1B, *Acquisition and Management of Computing Resources*	4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A1.2 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A3.1	N/A	N/A
DOE Order 1360.2B, *Unclassified Computer Security Program*	4.2.1.1-A2 4.2.1.4-A2	N/A	N/A
DOE Order 1360.4B, *Scientific and Technical Computer Software*	4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A1.2 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A3.1	N/A	N/A

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
DOE Order 1360.6A, *Automatic Data Processing Equipment/ Data Systems*	4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A1.2 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A3.1	N/A	N/A
DOE Order 4300.1C, *Real Property Management*	N/A	N/A	48 CFR 970
DOE Order 4320.2, *Capital Asset Management Process*	N/A	N/A	48 CFR 970
DOE Order 4330.2D, *In House Energy Management*	N/A	N/A	48 CFR 970
DOE Order 4330.4A, *Maintenance Management Program*	N/A	N/A	S/RID-M S/RID-MS 48 CFR 970
DOE Order N 4700.5, *Project Control System Guidelines* and DOE Order N 4700.6, *Extension of DOE N 4700.5*	N/A	N/A	S/RID-C
DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*	4.2.1.1-A2.1.1 4.2.1.1-A2.1.2 4.2.1.1-A2.1.3 4.2.1.1-A2.1.4 4.2.1.1-A2.2.4 4.2.1.4-A2.1.1 4.2.1.4-A2.1.2 4.2.1.4-A2.1.3 4.2.1.4-A2.1.4 4.2.1.4-A2.2.4	Reports Tank farm data Other waste site data Safety instrument data Historical database	S/RID-MS

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*	4.2.1.1-A1.1.1 4.2.1.1-A2.1.4 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2 4.2.1.4-A2.1.4	Radiation Leak Status Safety instrument data Reports	S/RID-EP TWRS 4.2 WHC-CM-1-6
DOE Order 5480.5, *Safety of Nuclear Facilities*	4.2.1.1-A1	Tank farm data Radiation Safety instrument data Alarms	S/RID-ED S/RID-NS S/RID-RP WHC-CM-1-6
DOE Order 5480.6, *Safety of Department of Energy Owned Reactors*	4.2.1.1-A2 4.2.1.4-A2	Radiation Safety instrument data Radiological levels	S/RID-RP WHC-CM-1-6
DOE Order 5480.7A, *Fire Protection*	4.2.1.1-A1.2.3 4.2.1.4-A1.2.2	Alarms Safety instrument data	S/RID-FP
DOE Order 5480.11, *Radiation Protection for Occupational Workers*	4.2.1.1-A1 4.2.1.4-A1	Radiation Radiological levels Safety instrument data	S/RID-ED WHC-CM-1-6 S/RID-RP
DOE Order 5480.19, *Conduct of Operations*	4.2.1.1-A2 4.2.1.4-A2	Interface with operators Interactive text display Interactive document trigger	S/RID-ED S/RID-MS S/RID-O
DOE Order 5480.23, *Nuclear Safety Analysis Reports*	N/A	Reports	S/RID-MS
DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*	4.2.1.1-A2.1.4 4.2.1.4-A2.1.4	Reports	S/RID-EP TWRS 4.2.1.1

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
DOE Order 5820.2A, *Radioactive Waste Management*	4.2.1.1-A1.1 4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.4 4.2.1.4-A1.1 4.2.1.4-A2.1 4.2.1.4-A2.4	Tank physical parameters Tank farm data Other waste site data Reports Waste transfer data Historical database	S/RID-EP S/RID-ER&WM TWRS 4.2 TWRS 4.2.1 TWRS 4.2.1.1 TWRS 4.2.1.4 WHC-CM-1-6
DOE-RL Implementing Procedure 1330.1B, *Computer Software Management*	4.2.1.1-A1.2 4.2.1.1-A2.1 4.2.1.1-A2.2 4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A1.2 4.2.1.4-A2.1 4.2.1.4-A2.2 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5 4.2.1.4-A3.1	N/A	S/RID-MS
DOE-RLIP 5300.1C, *Telecommunications Management*	4.2.1.1-A2.3 4.2.1.1-A2.4 4.2.1.1-A2.5 4.2.1.4-A2.3 4.2.1.4-A2.4 4.2.1.4-A2.5	N/A	N/A
INPO-85-013, *Plant Modification Control Program*	4.2.1.1-A1.1 4.2.1.1-A1.2 4.2.1.4-A1.1 4.2.1.4-A1.2	N/A	S/RID-ED
INPO-86-023, *Guidelines for Nuclear Power Station Construction Projects, "Good Practice"*	4.2.1.1 4.2.1.4	N/A	S/RID-C
INPO-87-030, *Performance Evaluations and Criteria for Corporate Evaluations*	4.2.1.1-A1 4.2.1.1-A2 4.2.1.4-A1 4.2.1.4-A2 4.2.1.4-A3	N/A	S/RID-CM

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
INPO-90-009, *Guidelines for Conduct of Design Engineering*	N/A	N/A	S/RID-ED
NFPA-72, *National Fire Protection Codes*	4.2.1.1-A1 4.2.1.1-A1.2.3 4.2.1.1-A2.2 4.2.1.4-A1.2.2 4.2.1.4-A2.2	Interface with operators Alarms Safety instrument data Utilities status	S/RID-FP
NRC 4.15, *Quality Assurance for Radiation Monitoring (Normal Operations) - Effluent Streams and the Environment*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Tank farm data Waste liquids Radiation Safety instrument data	S/RID-EP
WAC 173-303, *Dangerous Waste Regulations*	4.2.1.1-A1.1 4.2.1.1-A2.1.1 4.2.1.4-A1.1 4.2.1.4-A2.1.1	Tank farm data Reports	S/RID-EP S/RID-ER&WM
WAC 173-360, *Underground Storage Tank Regulations*	4.2.1.1-A1.1	Leak status Liquid intrusion level Vapor space temperature Liquid temperature Saltcake/sludge temperature Tank temperatures Tank levels Liquid surface level Ventilation status Special detector status Safety instrument data	S/RID-EP
WAC 173-400, *General Regulations for Air Pollution Sources*	4.2.1.1-A1.2.1	Tank farm data Safety instrument data Alarms Reports Ventilation Status	S/RID-EP

TABLE A2-2. INSTRUMENTATION UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
WAC 173-460, *Controls for New Sources of Toxic Air Pollutants*	4.2.1.1-A1.2.1	Tank farm data Safety instrument data Alarms Reports Ventilation Status	S/RID-EP
WAC 173-480, *Air Quality Standards and Emission Limits for Radionuclides*	4.2.1.1-A1.2.1	Tank farm data Radiation Radiological levels Safety instrument data Alarms Reports	S/RID-EP
WAC 246-247, *Radiation Protection - Air Emissions*	4.2.1.1-A1.2.1	Tank farm data Radiation Radiological levels Safety instrument data Alarms Reports Ventilation Status	S/RID-EP
WHC-CM-1-6, *WHC Radiological Control Manual*	4.2.1.1-A1.1.1 4.2.1.4-A1.1.1 4.2.1.4-A1.1.2	Radiation Radiological levels Reports Safety Instrument data Alarms	HSRCM-1 (1993), *Hanford Standard Radiological Control Manual*

APPENDIX B

FUNCTIONS AND REQUIREMENTS FOR

VENTILATION SYSTEM UPGRADE

NOTE: The requirements presented in this appendix are binding.

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

1.1 PURPOSE

The objective of the Ventilation System Upgrade is to restore the tank ventilation systems to an acceptable design basis and to resolve environmental, health, and safety concerns.

The purpose of this document is to identify the functions that must be performed by the upgraded ventilation systems, and the requirements that define how well the systems must perform each function. The functions and requirements will be used to develop a system design concept per the Systems Engineering process. The document also identifies interfaces between the functions of the ventilation system, and with the outside environment. (Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades are developed.) More information on the process is provided in Section 2.0 below.

1.2 SCOPE

This portion of Project W-314 will upgrade existing active Tank Farm ventilation systems as needed to support the TWRS mission. Specifically, the scope includes upgrades of the following systems.

- Primary ventilation systems in tank farms 241-AN, -AP, -AW, and -SY.
- Annulus ventilation systems in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY.
- Ventilation system in SST Farm 241-SX. (The need for continuing ventilation of the tanks in 241-SX is currently being evaluated. If it is concluded that the system is no longer needed, this upgrade will be deleted from the project scope.)
- Primary and annulus ventilation system for DCRT 244-A. (Current planning for the Transfer System Upgrade described in Appendix C includes continuing use of DCRT 244-A. If the scope of the Transfer System Upgrade is changed, the need for ventilation of this DCRT will be reevaluated.)

The scope of this project does not include upgrades of the following active ventilation systems.

- Primary ventilation systems in tank farms 241-AY and -AZ, which are being replaced by ongoing Project W-030, Tank Farm Ventilation Upgrades.
- Ventilation of SST 241-A-105, which has been evaluated and found to be unnecessary (WHC-SD-WM-RPT-075, *Recommendation on Need for an Exhauster on 241-A-105*).

- Ventilation system in SST Farm 241-C, which is being addressed by Project W-320, 241-C-106 Sluicing, and by the Waste Tank Safety Program.

- Primary and annulus ventilation of DCRTs 244-BX, -S, -TX, and -U, which will be isolated as part of the Transfer System Upgrade described in Appendix C. If the scope of the Transfer System Upgrade is changed, the need for ventilation of these DCRTs will be reevaluated.

The scope of the ventilation system upgrade extends from the ventilation inlets to the tanks, to the point of discharge where the exhaust air is released to the atmosphere. The scope includes all ductwork, filtration and air cleaning devices, fans, drains and seal pots, and stacks that lie between those points.

All local instrumentation required to monitor and operate the ventilation system will be provided as part of the ventilation system upgrade. The scope also includes all new instrumentation necessary for monitoring the exhaust air, local readouts and alarms, and local instrumentation enclosures. The local instrumentation systems will interface with the integrated instrumentation system upgrade described in Appendix A.

The scope also includes routing electrical power and other required utilities to ventilation and instrumentation system components, using existing sources where possible. The electrical scope of the ventilation upgrade interfaces with the electrical upgrade described in Appendix D.

Shelter will be provided, as required, for selected components and for personnel operating and maintaining the systems. Removal and disposition of existing equipment, as necessary, is also included in the scope.

Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades become available. In addition to those interfaces, the upgraded ventilation systems shall interface with existing systems and facilities, including the 242-A Evaporator and the 242-S Evaporator.

2.0 VENTILATION SYSTEM UPGRADE FUNCTIONS AND REQUIREMENTS

Specific functions and requirements were developed for the Ventilation System Upgrade to meet the requirements of DOE/RL-93-0106, Annex 2, *TWRS Systems Engineering Management Plan*. Each function is decomposed from a TWRS fourth-level function as identified in DOE/RL-92-60 Rev. 1, *Tank Waste Remediation System Functions and Requirements*.

The functions, requirements, and interfaces identified below will be used to develop a project design concept. The functions, requirements, and interfaces will then be further refined to provide a basis for detailed design.

The TWRS Systems Engineering process will continue as described in DOE/RL-93-0106, Annex 2. As each step in the process is completed, the functions and requirements identified for the Ventilation System Upgrade will be evaluated, and revised if necessary, to maintain continuity with the TWRS functions and requirements.

Section 2.3 of this appendix identifies the interfaces between the upgrade-specific functions, between the upgrade and the TWRS program, and between the upgrade and the external environment. Section 2.4 lists the requirements allocated to the functions and interfaces of the upgrade.

2.1 FUNCTION HIERARCHY

Each function identifed for the Ventilation System Upgrade is given a number of the format 4.2.i.j-Bx or -Bx.y. The first part of the number, 4.2.i.j, is the number of the TWRS fourth-level function from which the project-level function was decomposed. The "-B" indicates that it is a function allocated to the Ventilation System Upgrade, defined in Appendix B. The "x" or "x.y" completes the unique number within each "4.2.i.j" group. For example, 4.2.1.1-B1 indicates a function decomposed from TWRS function 4.2.1.1 and allocated to the upgraded ventilation system; and 4.2.1.1-B1.1 indicates a subfunction of 4.2.1.1-B1.

Figure B2-1 illustrates the hierarchy of the Ventilation System Upgrade functions, as decomposed from the TWRS fourth-level functions. The dotted lines between the fourth-level functions and the project-level functions represent several missing levels. Those levels will be developed as the TWRS systems engineering effort continues. The Function Description Sheets in Section 2.2 of this appendix define the assumptions that enabled the decomposition of each TWRS function to the project level.

Figure 2-1 in the main body of this document shows the hierarchy of the TWRS functions to the fourth level.

FIGURE B2-1. VENTILATION SYSTEM UPGRADE FUNCTION HIERARCHY

2.2 FUNCTION DESCRIPTION SHEETS

A Function Description Sheet is provided for each of the functions identified for the Ventilation System Upgrade. The Function Description Sheets provide the function definitions, enabling assumptions, interfaces, function requirements, and interface requirements. The sheets were prepared according to the format used in DOE/RL-92-60, as shown below.

I. FUNCTION ID NUMBER:

II. FUNCTION TITLE: Short description; verb followed by noun or noun phrase.

III. FUNCTION DEFINITION:

Primary statement of purpose. Brief description of what this function must accomplish to meet the overall mission, often including the scope of applicability.

IV. ENABLING ASSUMPTIONS:

Assumed interfaces, end states, and criteria that were made to further define the function, constrain the limits of applicability, or interpret system requirements. These assumptions necessitate additional analyses to determine impacts on the program.

V. INTERFACES

A. INPUTS

Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

B. OUTPUTS

Anything that leaves the function after it has been acted upon by that function.

VI. FUNCTION REQUIREMENTS

A qualitative or quantitative statement of how well a function must be performed. Function requirements may be one of two types: Constraints or Performance Requirements.

Constraints:
Requirements imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders).

Performance Requirements:
Requirements imposed upon the function by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

The numbering convention used for the identification of requiremetns in these tables is as follows:

4.2.1 C1 is the first constraint (C) allocated to function 4.2.1;
4.2.1 P1 is the first performance requirement (P) allocated to function 4.2.1;
4.2.1 I3 C1 is the first constraint allocated to input number I3 to function 4.2.1; and
4.2.1. O1 P1 is the first performance requirement allocated to output number O1 from function 4.2.1.

VII. INTERFACE REQUIREMENTS

A requirement that applies to the inputs to, or outputs from, a function. Interface requirements are either constraints or performance requirements.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1

II. **FUNCTION TITLE:** Ventilate DSTs.

III. **FUNCTION DEFINITION:**

Ventilate the DST. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks. It also includes the detection of leaks from the primary tank to the annulus.

The scope of this function includes ventilation of the following.

All DST primary tanks in tank farms 241-AN, -AP, -AW, and -SY
All DST annuli in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY

IV. **ENABLING ASSUMPTIONS:**

Existing waste will continue to be stored in existing tanks. Decomposition of Function 4.2.1.1 will include the fifth-level function "Store DST waste." The DSTs will continue to require ventilation until closure.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1 I4 DST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.1-B1 I5 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

4.2.1.1-B1 I6 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. OUTPUTS

4.2.1.1-B1 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from tank ventilation system operation.

4.2.1.1-B1 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.1

II. **FUNCTION TITLE:** Control temperature in DST.

III. **FUNCTION DEFINITION:**

Maintain the temperature in the DST vapor space and annulus within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. **ENABLING ASSUMPTIONS:**

Temperature control is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.1 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B1.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1.1 I5 DST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.

B. **OUTPUTS**

4.2.1.1-B1.1 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in DST vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the DST vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.2 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.2 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.2 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.3

II. **FUNCTION TITLE:** Control gasses in DST.

III. **FUNCTION DEFINITION:**

Control releases of gasses from the DST.

IV. **ENABLING ASSUMPTIONS:**

The DST ventilation system forms part of the DST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.3 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.3 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.3 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.3 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.3 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.3 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.4

II. **FUNCTION TITLE:** Control airborne particulates in DST.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from the DST.

IV. **ENABLING ASSUMPTIONS:**

The DST ventilation system forms part of the DST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.4 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.4 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.4 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1.4 I4 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.4 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.4 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.4 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.4 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.5

II. **FUNCTION TITLE:** Detect leaks from DST primary tank to annulus.

III. **FUNCTION DEFINITION:**

Detect the presence of radioactive material in the DST annulus offgas stream, indicating leakage from the DST primary tank to the annulus.

IV. **ENABLING ASSUMPTIONS:**

Leak detection is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.5 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.5 I2 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.5 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.5 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.5 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.5 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2

II. **FUNCTION TITLE:** Ventilate SSTs in 241-SX

III. **FUNCTION DEFINITION:**

Ventilate the SST. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks.

The scope of this function includes ventilation of all tanks in Tank Farm 241-SX.

IV. **ENABLING ASSUMPTIONS:**

Existing waste will continue to be stored in existing tanks. Decomposition of Function 4.2.1.1 will include the fifth-level function "Store SST waste." The SSTs in 241-SX will continue to require ventilation until closure.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B2 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2 I4 SST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.1-B2 I5 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

4.2.1.1-B2 I6 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. OUTPUTS

4.2.1.1-B2 O1 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.1

II. **FUNCTION TITLE:** Control temperature in SST.

III. **FUNCTION DEFINITION:**

Maintain the temperature in the SST vapor space within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. **ENABLING ASSUMPTIONS:**

Temperature control is an integral part of environmentally sound, safe storage of waste within the SST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.1 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B2.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.1 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2.1 I4 SST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.

B. **OUTPUTS**

4.2.1.1-B2.1 O1 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.1 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in SST vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the SST vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the SST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.2 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.2 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.2 O1 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.3

II. **FUNCTION TITLE:** Control gasses in SST.

III. **FUNCTION DEFINITION:**

Control releases of gasses from the SST.

IV. **ENABLING ASSUMPTIONS:**

The SST ventilation system forms part of the SST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.3 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.3 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.3 O1 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.3 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.3 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.3 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.4

II. **FUNCTION TITLE:** Control airborne particulates in SST.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from the SST.

IV. **ENABLING ASSUMPTIONS:**

The SST ventilation system forms part of the SST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-21.4 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.4 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.4 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2.4 I4 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.4 O1 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.4 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.4 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.4 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1

II. **FUNCTION TITLE:** Ventilate DCRT 244-A

III. **FUNCTION DEFINITION:**

Ventilate the DCRT. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks. It also includes the detection of leaks from the primary tank to the annulus.

The scope of this function includes ventilation of the primary tank and the annulus of DCRT 244-A.

IV. **ENABLING ASSUMPTIONS:**

DCRT 244-A will remain in use as part of the upgraded waste transfer system to be provided by Project W-314. Existing DCRTs 244-BX, -S, -TX, and -U will be isolated as part of the Transfer System Upgrade of Project W-314.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1 I2 Heat From: TWRS 4.2.1.4

Heat generated by the waste in the tank.

4.2.1.4-B1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1 I5 DCRT Integrity Data From: TWRS 4.2.1.4

Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.4-B1 I6 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

4.2.1.4-B1 I7 Airborne Particulates From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

B. OUTPUTS

4.2.1.4-B1 01 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.1

II. **FUNCTION TITLE:** Control temperature in DCRT.

III. **FUNCTION DEFINITION:**

Maintain the temperature in the DCRT vapor space and annulus within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. **ENABLING ASSUMPTIONS:**

Temperature control is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.1 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.1 I2 Heat From: TWRS 4.2.1.4

Heat generated by the waste in the tank.

4.2.1.4-B1.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1.1 I5 DCRT Integrity Data From: TWRS 4.2.1.4

Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.

B. **OUTPUTS**

4.2.1.4-B1.1 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.1 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in DCRT vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the DCRT vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.2 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.2 I3 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.2 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.3

II. **FUNCTION TITLE:** Control gasses in DCRT.

III. **FUNCTION DEFINITION:**

Control releases of gasses from DCRT.

IV. **ENABLING ASSUMPTIONS:**

The DCRT ventilation system forms part of the DCRT confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.3 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.3 I3 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.3 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.3 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.3 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.3 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.4

II. **FUNCTION TITLE:** Control airborne particulates in DCRT.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from DCRT.

IV. **ENABLING ASSUMPTIONS:**

The DCRT ventilation system forms part of the DCRT confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.4 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.4 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.4 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1.4 I4 Airborne Particulates From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.4 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.4 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.4 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.4 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.5

II. **FUNCTION TITLE:** Detect leaks from DCRT primary tank to annulus.

III. **FUNCTION DEFINITION:**

Detect the presence of radioactive material in the DCRT annulus offgas stream, indicating leakage from the DCRT primary tank to the annulus.

IV. **ENABLING ASSUMPTIONS:**

Leak detection is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.5 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.5 I2 Airborne Particulates From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.5 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.5 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.5 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.5 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.3.2-B1

II. **FUNCTION TITLE:** Disposition tank gaseous effluent.

III. **FUNCTION DEFINITION:**

Collect gaseous effluents from the tanks whose ventilation systems are being upgraded by Project W-314B. Remove contaminants from the gaseous effluent streams. Sample filtered off gasses from the tanks, and monitor radioactive, chemical, and physical characteristics of the gasses. Transport and disposition (release) filtered, monitored off gasses to environment.

The scope of this function includes the disposition of gaseous effluent from the following sources.

All DST primary tanks in tank farms 241-AN, -AP, -AW, and -SY
All DST annuli in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY
All SSTs in Tank Farm 241-SX
DCRT 244-A

IV. **ENABLING ASSUMPTIONS:**

The tanks included in the scope of this upgrade will continue to require ventilation until closure. The tank ventilation systems extend to the point of discharge of treated gases to the environment.

V. **INTERFACES**

A. **INPUTS**

4.2.3.2-B1 I1 DST Gaseous Effluent From: 4.2.1.1-B1

DST offgas streams for treatment and release.

4.2.3.2-B1 I2 SST Gaseous Effluent From: 4.2.1.1-B2

SST offgas streams for treatment and release.

4.2.3.2-B1 I3 DCRT Gaseous Effluent From: 4.2.1.4-B1

DCRT offgas streams for treatment and release.

B. **OUTPUTS**

4.2.3.2-B1 O1 Liquid Effluent from Tank DGE To: 4.2.3.3-B1

Liquid effluent streams for treatment and disposition.

4.2.3.2-B1 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from tank gaseous effluent disposition system operation.

4.2.3.2-B1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

Tank gaseous effluent disposition system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.3.2-B1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

4.2.3.2-B1 05 Dispositioned Gaseous Effluent To: External

Filtered, scrubbed, and monitored gasses released to the atmosphere.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.3.3-B1

II. **FUNCTION TITLE:** Receive liquid effluent from tank offgas disposition activities.

III. **FUNCTION DEFINITION:**

Collect and sample liquid effluent generated during tank offgas disposition activities, and route to a compatible Manage Tank Waste function, route for reuse, or route for treatment.

The scope of this function includes the collection and sampling of liquid effluent generated from operation of the exhaust systems provided by Project W-314B.

IV. **ENABLING ASSUMPTIONS:**

Tank offgas disposition activities will produce liquid effluent that must be dispositioned. No other activities within the system scope will produce liquid effluent. Decomposition of Function 4.2.3.3 will include the fifth-level function "Receive Liquid Effluent." The project scope includes collection, sampling, storage, and delivery for treatment of liquid effluent generated by tank offgas disposition activities. It does not include treatment and disposal of the effluent.

V. **INTERFACES**

A. **INPUTS**

4.2.3.3-B1 I1 Liquid Effluent from Tank DGE From: 4.2.3.2-B1

Liquid effluent streams generated from gaseous effluent disposition activities.

B. **OUTPUTS**

4.2.3.3-B1 O1 Liquid Effluent for Disposition To: TWRS 4.2.3.3

Liquid effluent streams collected for treatment and disposition.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.3.4-B1

II. **FUNCTION TITLE:** Segregate solid waste from ventilation system operation activities.

III. **FUNCTION DEFINITION:**

Segregate wastes of differing radioactive classifications and incompatible dangerous waste characteristics to ensure no cross-contamination of wastes and eliminate the potential for reaction of incompatible chemical constituents.

The scope of this function includes the segregation of solid wastes generated from operation of the systems provided by Project W-314B.

IV. **ENABLING ASSUMPTIONS:**

The project scope includes the disposal of displaced equipment and other solid waste produced by project construction and startup activities; however, this is not considered a function of the systems provided by the project. Decomposition of Function 4.2.3.4 will include the fifth-level function "Segregate solid waste." Characterization, packaging, and shipping of segregated solid waste from system operation are outside the project scope.

V. **INTERFACES**

A. **INPUTS**

4.2.3.4-B1 I1 Solid Waste From: 4.2.1.1-B1, 4.2.1.1-B2, 4.2.1.4-B1, 4.2.3.2-B1

Solid waste generated from tank ventilation system and gaseous effluent disposition system operation.

B. **OUTPUTS**

4.2.3.4-B1 O1 Segregated Solid Waste To: TWRS 4.2.3.4

Segregated solid waste for disposition.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table B2-2 for requirements allocated to the interfaces of this function.

I. **FUNCTION ID NUMBER:** 4.2.3.6-B1

II. **FUNCTION TITLE:** Receive reusable materials from ventilation system operation activities.

III. **FUNCTION DEFINITION:**

Accumulate materials that are suitable for reuse or that can be economically treated so that they are suitable for reuse to other functions as they are needed and as they are available. This includes mixing of materials from various sources if they are reusable as a mixture.

The scope of this function includes the accumulation of reusable materials generated from operation of the systems provided by Project W-314B.

IV. **ENABLING ASSUMPTIONS:**

The project scope includes the disposition of displaced equipment and other reusable materials produced by project construction and startup activities; however, this is not considered a function of the systems provided by the project. Decomposition of Function 4.2.3.6 will include the fifth-level function "Receive reusable materials." Storage, treatment, and delivery to the user of reusable materials from system operation are outside the project scope.

V. **INTERFACES**

A. **INPUTS**

4.2.3.6-B1 I1 Reusable Materials From: 4.2.1.1-B1, 4.2.1.1-B2, 4.2.1.4-B1, 4.2.3.2-B1

Reusable materials generated from tank ventilation system and gaseous effluent disposition system operation.

B. **OUTPUTS**

4.2.3.6-B1 O1 Accumulated Reusable Materials To: TWRS 4.2.3.6

Accumulated reusable materials for disposition.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table B2-2 for requirements allocated to the interfaces of this function.

2.3 INTERFACE IDENTIFICATION

Table B2-1 below lists the interfaces of the Ventilation System Upgrade functions. Interfaces are inputs and outputs of functions. An input is defined as anything that is acted upon by a function to produce desired outputs; an output is anything that leaves a function after it has been acted upon by that function. Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades become available.

NOTE: Functions designated TWRS 4.2.x.x (for example, TWRS 4.2.1.1) are fourth-level functions from DOE/RL-92-60. See Figure 2-1, in the main body of this document, for the TWRS function hierarchy.

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Air *Air entering the tank ventilation system from the atmosphere.*	External	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5
Heat *Heat generated by the waste in the tank, and (in DSTs and SSTs) heat generated by the operation of mitigation and/or retrieval equipment.*	TWRS 4.2.1.1 TWRS 4.2.1.3	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B2 4.2.1.1-B2.1
	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.1

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Vapor Characterization Data *Information about the constituents of the gasses in the vapor space of each tank.*	TWRS 4.2.1.2	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4
Waste Characterization Data *Information about the constituents of the waste in each tank.*	TWRS 4.2.1.2	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.4 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.4
DST Integrity Data *Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.*	TWRS 4.2.1.1	4.2.1.1-B1 4.2.1.1-B1.1
SST Integrity Data *Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.*	TWRS 4.2.1.1	4.2.1.1-B2 4.2.1.1-B2.1
DCRT Integrity Data *Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.*	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.1

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Gasses *Gasses generated by the waste in the tank.*	TWRS 4.2.1.1	4.2.1.1-B1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B2 4.2.1.1-B2.2 4.2.1.1-B2.3
	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.2 4.2.1.4-B1.3
Airborne Particulates *Airborne particulates generated by the waste in the tank.*	TWRS 4.2.1.1	4.2.1.1-B1 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.4
	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.4 4.2.1.4-B1.5
DST Gaseous Effluent *DST offgas streams for treatment and release.*	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5	4.2.3.2-B1
SST Gaseous Effluent *SST offgas streams for treatment and release.*	4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4	4.2.3.2-B1
DCRT Gaseous Effluent *DCRT offgas streams for treatment and release.*	4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5	4.2.3.2-B1
Liquid Effluent from Tank DGE *Liquid effluent streams generated from gaseous effluent disposition activities.*	4.2.3.2-B1	4.2.3.3-B1
Liquid Effluent for Disposition *Liquid effluent streams collected for treatment and disposition.*	4.2.3.3-B1	TWRS 4.2.3.3

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Solid Waste *Solid waste generated from tank ventilation system and gaseous effluent disposition system operation.*	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1	4.2.3.4-B1
Segregated Solid Waste *Segregated solid waste for disposition.*	4.2.3.4-B1	TWRS 4.2.3.4
Excess Equipment/Facilities *Ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.*	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1	TWRS 4.2.3.5

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Reusable Materials *Materials economically suitable for reuse by TWRS or other programs.*	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1	4.2.3.6-B1
Accumulated Reusable Materials *Accumulated reusable materials for disposition.*	4.2.3.6-B1	TWRS 4.2.3.6
Dispositioned Gaseous Effluent *Filtered, scrubbed, and monitored gasses released to the atmosphere.*	4.2.3.2-B1	External

2.4 FUNCTIONAL AND INTERFACE REQUIREMENTS ALLOCATION

Table B2-2 below lists the constraints that are allocated to the functions and interfaces of the Ventilation System Upgrade. The development of performance requirements for the ventilation system is dependent on characterization of tank vapors, an effort currently underway. The performance requirements will be included in a future revision of this document.

See Section 3.0 in the main body of this document for additional instructions regarding the application of the requirements listed below.

The table also lists the source(s) for each requirement, according to the following key:

FFCA	NESHAPs Federal Facility Compliance Agreement (WHC Incoming Correspondence No. 9401181). **Note that the Agreement specifies the stacks that must comply with NESHAPs monitoring requirements. Stacks not specified in the FFCA are not required to comply with NESHAPs monitoring requirements, but are still subject to site total emission limits.**
S/RID	Tank Farms Standards/Requirements Identification Document, High Level Waste Storage Tank Farms
S/RID-EP	S/RID, Functional Area "Environmental Protection"
S/RID-ER&WM	S/RID, Functional Area "Environmental Restoration and Waste Management"
S/RID-RP	S/RID, Functional Area "Radiological Protection"
TWRS 4.2.x.x	Fourth-level function to which the requirement is allocated, per DOE/RL-92-60

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*	4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1	Dispositioned Gaseous Effluent	FFCA S/RID-EP TWRS 4.2.1.1

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
40 CFR 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes*	4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.3.2-B1		S/RID-EP
40 CFR 260, *Hazardous Waste Management System: General*	4.2.3.4-B1 4.2.3.6-B1		TWRS 4.2.3.4 TWRS 4.2.3.6
40 CFR 261, *Identification and Listing of Hazardous Waste*	4.2.3.4-B1		TWRS 4.2.3
40 CFR 262, *Standards Applicable to Generators of Hazardous Waste*	4.2.3.4-B1	Segregated Solid Waste	TWRS 4.2.3 TWRS 4.2.3.4
40 CFR 264, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*		Dispositioned Gaseous Effluent	TWRS 4.2.3
40 CFR 265, *Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE/EH-0135, *Performance Objectives and Criteria for Technical Safety Appraisals at DOE Facilities and Sites*	4.2.1.1-B1.5 4.2.1.4-B1.5 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE Order 5400.1, *General Environmental Protection Program Requirements*, Chapter IV	4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition Accumulated Reusable Material	S/RID-EP TWRS 4.2 TWRS 4.2.3
DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*, Chapter III	4.2.1.1-B1.5 4.2.1.4-B1.5 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP
DOE Order 5820.2A, *Radioactive Waste Management*, Chapter I, Section 3	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1		TWRS 4.2 TWRS 4.2.1 TWRS 4.2.1.1 TWRS 4.2.1.4
DOE Order 5820.2A, *Radioactive Waste Management*, Chapter III, Section 3	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.4-B1		S/RID ER&WM TWRS 4.2 TWRS 4.2.1.1 TWRS 4.2.3 TWRS 4.2.3.4
DOE Order 5820.2A, *Radioactive Waste Management*, Chapter V		Excess Equipment/Facilities	TWRS 4.2
DOE-RL Implementing Procedure 5480.11, *Radiation Protection for Occupational Workers*		Accumulated Reusable Material	TWRS 4.2 TWRS 4.2.3.2

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
NRC 4.15, *Quality Assurance for Radiation Monitoring (Normal Operations) - Effluent Streams and the Environment*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
WAC 173-303, *Dangerous Waste Regulations*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1 4.2.3.4-B1	Segregated Solid Waste Accumulated Reusable Materials DST Integrity Data SST Integrity Data DCRT Integrity Data	S/RID-EP TWRS 4.2.3
WAC 173-360, *Underground Storage Tank Regulations*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
WAC 173-400, *General Regulations for Air Pollution Sources*	4.2.1.1-B1.4 4.2.1.1-B2.4 4.2.1.4-B1.4 4.2.3.2-B1		S/RID-EP
WAC 173-460, *Controls for New Sources of Toxic Air Pollutants*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	
WAC 173-470, *Ambient Air Quality Standards for Particulate Matter*	4.2.1.1-B1.4 4.2.1.1-B2.4 4.2.1.4-B1.4 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP
WAC 173-480, *Ambient Air Quality Standards and Emission Limits for Radionuclides*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP TWRS 4.2
WAC 246-247, *Radiation Protection - Air Emissions*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP TWRS 4.2

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
WHC-CM-7-5, *Environmental Compliance*	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	TWRS 4.2

APPENDIX C

FUNCTIONS AND REQUIREMENTS FOR

WASTE TRANSFER SYSTEM UPGRADE

NOTE: The requirements presented in this appendix are binding.

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

1.1 PURPOSE

As part of the Tank Farm Restoration and Safe Operations Project (W-314), the objective of the Waste Transfer System (WTS) Upgrade is to provide regulatory compliant pipelines from the single-shell tank (SST) farms and Area Waste Generators (AWG) within the 200 areas to the double-shell tank (DST) system.

The purpose of this document is to identify the functions that must be performed by the upgraded WTS, and the requirements that define how well the WTS must perform each function. The document also identifies interfaces between the functions of the WTS and the outside environment. More information on the process of developing functions, requirements, and interfaces is provided in Section 2.0 below.

1.2 SCOPE

This portion of Project W-314 will upgrade the existing liquid waste transfer systems (LWTS) as needed to support the TWRS mission. Specifically the scope includes the upgrade of existing systems in the following functional areas:

- Transfers from SSTs and AWGs in the 200 West and 200 East Areas to the DST system, including any interim storage and conditioning that may be required.
- Waste transfers between DST tank farms within the A-Farm Complex (Tank farms 241-AY, -AZ, -AN, -AP and -AW). Upgrades to diversion boxes, valve pits, ancillary equipment and pipelines may be required. This project will perform these upgrades from the two entrance points into the A-Farm complex, 241-AR-151 and 244-A DCRT, and will terminate at the valve pit of each DST farm. Upgrades within a specific DST or SST farm are not within the scope of this project.

Interfaces with other upgrades provided by Project W-314 will be refined as the functions and requirements for those upgrades are further developed. In addition to those interfaces, the upgraded WTS may interface with Projects W-028 (Aging Waste Transfer Line), W-058 (Replacement of the Cross-Site Transfer System), W-087 (Radioactive Liquid Waste Line Replacement), W-151 (101-AZ Waste Retrieval) and W-211 (Initial Tank Retrieval System).

Even though the scope of this project entails only portions of the overall physical transfer route between the SSTs and the DST system, the top level functional analysis presented within this document has been organized in such a manner to include the entire function of liquid waste transfer. This was done in order to provide a consistent thread of functionality. It is assumed that during concept development, requirements will be allocated as appropriate to elements of the existing system, other upgrade projects (e.g., W-058) or to this project.

2.0 WASTE TRANSFER SYSTEM UPGRADE FUNCTIONS AND REQUIREMENTS

Specific functions and requirements were developed for the WTS Upgrade to meet the requirements of DOE/RL-93-0106, Annex 2. Each function is decomposed from a TWRS fourth-level function as identified in DOE-RL-92-60 Rev. 1, TWRS Functions and Requirements.

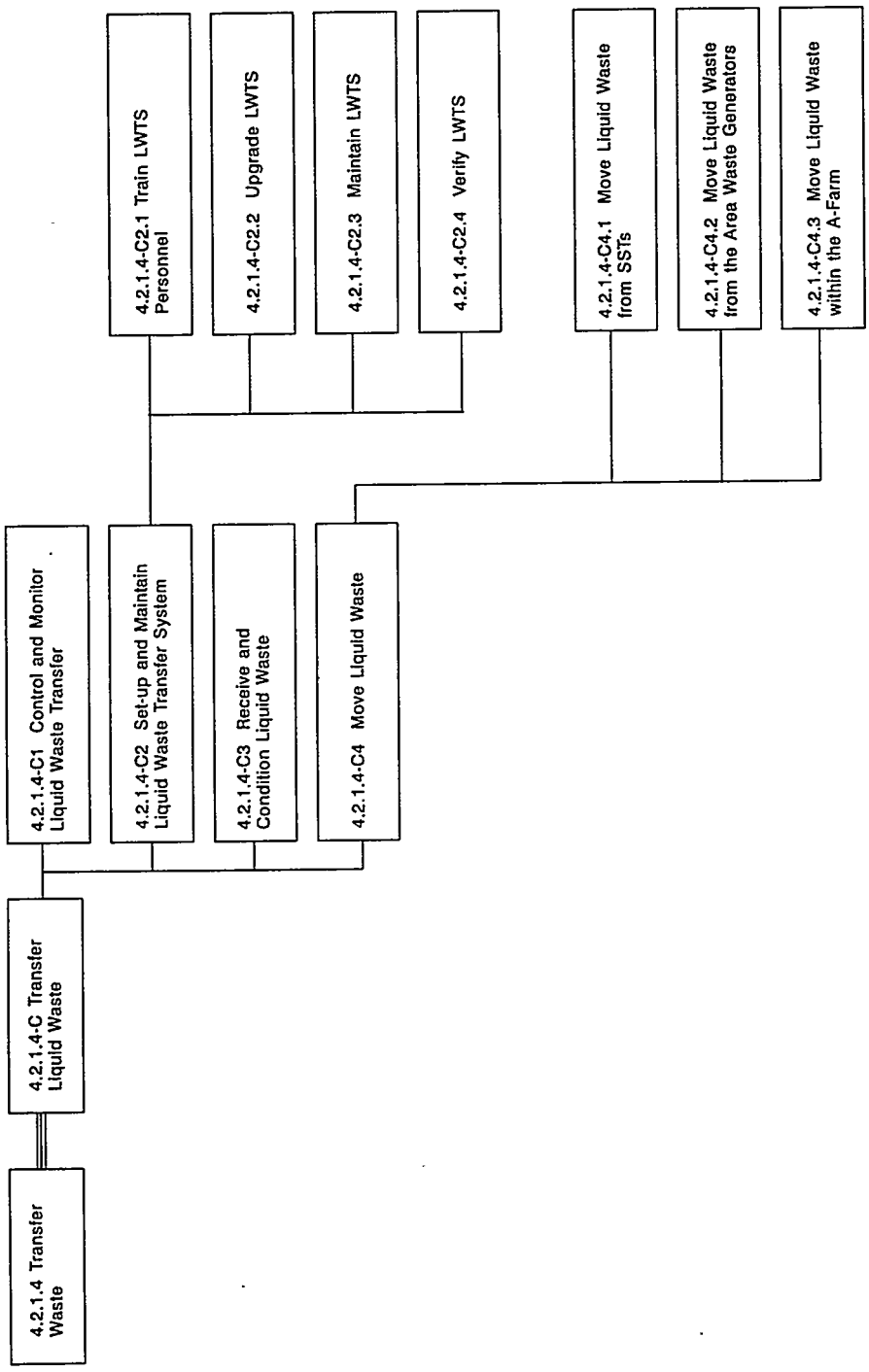
2.1 FUNCTION HIERARCHY

Each function identified for the WTS Upgrade is given a number of the format 4.2.1.j-Cx or Cx.y. The first part of the number 4.2.i.j, is the number of the fourth-level function from which the project-level function was decomposed. The "-C" indicates that it is a function allocated to the WTS Upgrade. The "x" or "x.y" indicates the unique number within each "4.2.i.j" group. For example, 4.2.1.4-C1 indicates a function decomposed from TWRS function 4.2.1.4 and allocated to the WTS Upgrade project; and 4.2.1.4-C1.1 indicates a subfunction of 4.2.1.4-C1.

Figure C2-1 indicates the hierarchy of the WTS Upgrade functions, as decomposed from the TWRS fourth-level functions. The dotted lines between the fourth level functions and the project level functions represent several missing levels. Those levels will be developed as the TWRS systems engineering effort continues. The Function Description Sheets in Section 2.2 of this appendix define the assumptions that enabled the decomposition of each TWRS function to the project level.

Figure 2-1 in the main body of this document shows the hierarchy of the TWRS functions to the fourth level.

Figure C2-1. Transfer System Upgrade Function Hierarchy.



2.2 FUNCTION DESCRIPTION SHEETS

A Function Description Sheet (FDS) is provided for each of the functions identified for the WTS upgrade. The FDSs provide the function definitions, enabling assumptions, interfaces, function requirements and interface requirements. The FDSs were prepared according to the format shown below.

I. **Function ID Number**

A unique identification number for each function of the function tree.

II. **Function Title**

A short description used to identify the function, usually in terms of a verb followed by a noun or a noun phrase.

III. **Function Definition**

A function is a primary statement of purpose; a definition of what a system or subsystem must accomplish to meet the overall mission. The function definition is a brief description of what this particular function must accomplish, often including the scope of applicability.

IV. **Enabling Assumptions**

Assumed interfaces, end states, and criteria that were made to further defined the function, constrain the limits of applicability, or interpret system requirements. These assumptions necessitate additional analyses to determine impacts on the program.

V. Interfaces

A. **Inputs (I)**

Anything that is acted upon by a function to produce desired output. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

B. **Outputs (O)**

Anything that leaves the function after it has been acted upon by that function.

VI. **Function Requirements**

A qualitative or quantitative statement of how well a function must be performed. Function requirements may be one of two types: Constraints or Performance Requirements.

Constraints (C)
Requirements imposed upon the function by the external environment (e.g., U.S. Congress, EPA, DOE Orders).

Performance Requirements (P)
Requirements imposed upon the function by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

The numbering convention used for the identification of requirements in these tables is as follows:

4.2.1 C1 is the first constraint (C) allocated to function 4.2.1;
4.2.1 P1 is the first performance requirement (P) allocated to function 4.2.1

Issues
If the requirements are inadequate, if they conflict with other requirements, if they are not yet allocable, or if they are likely to change, an issue should be identified.

Requirements Analysis
Any activity, study, negotiation, etc., that is necessary to resolve the "Issue."

VII. **Interface Requirements**

A requirement that applies to the inputs to, or outputs from, a function. Interface requirements are either Constraints or Performance Requirements, depending upon their origin. The numbering convention used for the identification of requirements in these tables is as follows:

4.2.1 O1 P1 would be the first performance requirement allocated to output number O1 from function 4.2.1
4.2.1 I3 C1 is the first constraint allocated to input number I3 to function 4.2.1

I. **FUNCTION ID NUMBER:** 4.2.1.4-CO

II. **FUNCTION TITLE:** Transfer Liquid Waste (TLW)

III. **FUNCTION DESCRIPTION:**

This function provides for the transfer of liquid waste within the 200 area in support of the TWRS Program. Transfer actions include providing overall control of the transfer process, set-up and maintenance of the transfer system, receipt of liquid waste from the SST waste retrieval projects and the AWGs, any necessary accumulation and conditioning of the waste, and the transfer of that waste into the DST system. Additionally, this function provides for waste transfers between DSTs within the A-Farm Complex.

IV. **ENABLING ASSUMPTIONS:**

1. The only active 200 area generation sites expected to interface with the upgraded Waste Transfer System are T Plant, the Plutonium Finishing Plant (PFP), and the 222-S laboratory.

2. Conditioning of the SST waste will be required, to some extent, in order to transfer it and ensure compatibility with both the transfer system and the destination DST. Waste received from the AWGs may already be preconditioned prior to this function.

3. The scope of this effort does not include the 6 DSTs of Project W-236A (Multi-Function Waste Tank Facility).

4. The scope of this effort does not include waste transfer to or within the 200-H Core Area.

5. Temporary storage (accumulation) and batching of the waste received from the SST waste retrieval efforts and the 200 area generators will be required for economical transfers.

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-CO I1 Retrieved Waste
(From: 4.2.1.3)

Waste extracted from a SST or received from a 200 area waste generator.

4.2.1.4-CO I2 Waste Characterization Data
(From: 4.2.1.2)

All waste characterization data provided by the Characterize Waste function needed to ensure the safe handling of the waste.

4.2.1.4-CO I3 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.

4.2.1.4-CO I4 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.

4.2.1.4-CO I5 Retrieved A-Farm Waste
(From: 4.2.1.3)

Liquid waste retrieved from an A-Farm DST for inter-farm transfer.

4.2.1.4-CO I6 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

4.2.1.4-CO I7 Waste Transfer Data
(From: 4.2.1.4-A1)

These are networked data signals which can be read by archive and direct display devices.

B. OUTPUTS

4.2.1.4-CO O1 Waste to Storage
(To: 4.2.1.1)

Liquid waste ready for transfer into the DST system. This includes any line flushing solution required after the completion of a transfer.

4.2.1.4-CO O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

4.2.1.4-CO O3 A-Farm Waste to Storage
(To: 4.2.1.1)

Waste received from an A-Farm DST ready for input into another A-Farm DST.

VI. FUNCTIONAL REQUIREMENTS:

A. CONSTRAINTS

4.2.1.4-CO C1 Management of High Level Waste (HLW)

(Ref: DOE & RLID 5820.2A)
The waste characterization, storage and transfer of HLW shall conform to DOE & RLID 5820.2A, Chapter 1.

4.2.1.4-CO C2 Management of Low Level Waste (LLW)

(Ref: WAC 173-303, Section 640)
The waste characterization, storage and transfer of LLW shall conform to WAC 173-303, Section 640.

4.2.1.4-CO C3 Management of Transuranic Waste

(Ref: DOE & RLID 5820.2A)
Transuranic waste shall be characterized, segregated and handled in accordance with DOE & RLID 5820.2A, Chapter II.

4.2.1.4-CO C4 SST Transfer System Service Life

(Ref: Derived, TPA Milestone M-45-0)
The service life of SST transfer system components shall be no less than 20 (TBR) years.

4.2.1.4-CO C4 Issue 1 Required Analysis 1

The required SST transfer system service life estimates are based on the SST waste retrieval schedule in the TPA. This estimate may need to be modified in order to reflect a desired design margin and the requirements of other potential system users.

4.2.1.4-CO C5 DST Transfer System Service Life

(Ref: Derived, TPA Milestone M-50-00, M-51-00, M-60-00)
The service life of DST transfer system components shall be no less than 30 (TBR) years.

4.2.1.4-CO C5 Issue 1 Required Analysis 1

The required DST transfer system service life estimates are based on the SST waste retrieval and the waste processing schedules in the TPA. These TPA milestones indicate that waste vitrification must be complete by December 2028. This estimate may need to be modified in order to reflect a desired design margin and the requirements of other potential system users. Additionally, this date should be consistent with other projects, such as W-058, which has a FDC stated design life of 50 years.

4.2.1.4-CO C6 Facility Design Criteria

(Ref: RLID 5820.2A, 7.a.2)
Waste transfer facilities shall comply with DOE 4700.1, DOE 6430.1A, RL 6430.1C, and DOE 5700.3.

4.2.1.4-CO C7 New Transfer Facility Siting

(Ref: RLID 5820.2A, 7.a.1)
Siting of new transfer facilities shall be accomplished in accordance with DOE 4320.1B and RL 4320.2C.

4.2.1.4-CO C8 Existing Facility Upgrades

(Ref: RLID 5820.2A, 7.b.5)
Upgrade of existing facilities for continued use shall be in accordance with RLID 5820.2a, 7.b.1 through 6.

4.2.1.4-CO C9 Transfer System Design Standardization

(Ref: Derived, Engineering Judgment, W-314 Integration Meeting 5/18/94)
The design of the transfer system shall utilize existing installed Hanford site designs when those designs can be shown to satisfy system requirements and program objectives.

4.2.1.4-CO C10 Single Point Failures

(Ref: Derived, DOE Order 6430.1A; DOE Order 5820.2a, Chap. 1, 3.a.(1))
The design of the system shall ensure that no single point failure shall place the system in an unsafe configuration where critical functions can not continue to be performed. Critical functions include safety class items in accordance with the Safety Equipment List, and other functions whose malfunction could cause major damage to the system or result in TBD hazards.

4.2.1.4-CO C11 Shielding

(Ref: DOE Order 5480.11; 10 CFR 61.40, 43; WHC-CM-4-9, WHC-CM-4-11)
The design of the system shall ensure that all components and equipment are adequately shielded given their inherent radiation hardness and the exposed environment. Nonpermanent shielding methods may be used as required.

4.2.1.4-CO C12 Surface Radiation

(Ref: DOE Order 5480.11; 10 CFR 61.40, 43; WHC-CM-4-9, WHC-CM-4-11)
The radiation field at the surface of below-ground structures where the

structure contacts the soil in the controlled access areas shall not exceed 0.2 mrem/hr on average.

4.2.1.4-CO C13 Materials

(Ref: DOE Order 5820.2A, Chap. 1, 3.b.(7); WHC-SD-OCD-15, page 7)
Materials used in the design of the system shall be compatible with the exposed environment, including radiation, process solutions, acid and caustic vapors and solutions, and known decontamination agents. They must either last the life of the system or be readily replaceable. Replaceable materials which are expected to degrade must be compatible with downstream chemical pretreatment of the waste if they enter the waste stream.

B. PERFORMANCE REQUIREMENTS

4.2.1.4-CO P1 Transfer System Availability

(Ref: TBD)
The liquid waste transfer system shall have a system availability of no less than 50% (TBR). System availability is defined as the probability the transfer system will be available for use excluding scheduled downtime.

4.2.1.4-CO P1 Issue 1 Required Analysis 1

A meaningful system availability figure is important as it aids in guiding the overall complexity and robustness of the transfer system design. Additionally, it is key in the calculation of the overall transfer capacity required for the system. For example, the transfer capacity may have to be increased if the system is only available 10 percent of the time. This tentative availability number provided should be revised as the system concept matures.

VII. INTERFACE REQUIREMENTS:

A. INPUTS

4.2.1.4-CO I1 Retrieved Waste

4.2.1.4-CO I1 P1 Transfer System Performance

(Ref: Derived, TPA M-45-00, Engineering Study WHC-SD-W314C-ES-001)
The liquid waste transfer system shall be capable of transferring 6 million (TBR) gallons of received liquid waste a month.

4.2.1.4-CO I1 P1 Issue 1 Required Analysis 1

The characterization of the waste to be received (including dilution ratio) is not known at this time. The performance requirement stated above represents the best engineering estimate that can be made at this time based on an estimated SST retrieval schedule and additional volumes created by dilution and line flushing.

4.2.1.4-CO I1 Issue 2 Required Analysis 1

The expected nature of the waste and the way it will interface with the Transfer Liquid Waste function is unknown at this time. Specific requirements relating to the interface will need to be deferred until better characterization data is available. Close project integration will be necessary to insure the interface chosen is optimized for a true system solution.

4.2.1.4-CO I2 Waste Characterization Data

N/A

4.2.1.4-CO I3 Raw Materials for TLW

N/A.

4.2.1.4-CO I4 Reusable Materials for TLW

N/A.

4.2.1.4-CO I5 Retrieved A-Farm Waste

N/A.

4.2.1.4-CO I6 Operations Data for Transfer

N/A.

4.2.1.4-CO I7 Waste Transfer Data

N/A.

B. OUTPUTS

4.2.1.4-CO O1 Waste to Storage

N/A.

4.2.1.4-CO O2 Excess Facilities from TLW

4.2.1.4-CO O2 C1 Design for Decommissioning and Decontamination

(Ref: Derived, DOE 6430.1A)
The transfer system shall be designed to prevent internal accumulation of waste and to simplify the task of decontamination and decommissioning.

4.2.1.4-CO O3 A-Farm Waste to Storage

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C1

II. **FUNCTION TITLE:** Control and Monitor Liquid Waste Transfer (C&M)

III. **FUNCTION DESCRIPTION:**

This function provides for the control and monitor capabilities necessary to set-up, perform, and complete a liquid waste transfer operation. This function is expected to interface significantly with the control and monitor functions provided by the Project W-314 instrumentation upgrade (function 4.2.1.4-A).

IV. **ENABLING ASSUMPTIONS:**

This function overlaps extensively with those functions provided for waste transfer under the instrumentation upgrades portion of Project W-314. As the instrumentation upgrade functions deal primarily with monitoring functions and safety interlocks, the intent of this function is to provide a complete framework for control and monitoring functionality, whether that functionality may be allocated at a later time to personnel or hardware/software.

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C1 I1 Waste Characterization Data
(From: 4.2.1.2)

All waste characterization data provided by the Characterize Waste function needed to ensure the safe handling of the waste.

4.2.1.4-C1 I2 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

4.2.1.4-C1 I3 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the TLW function.

4.2.1.4-C1 I4 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the TLW function.

4.2.1.4-C1 I5 Waste Transfer Data
(From: 4.2.1.4-A1)

These are networked data signals which can be read by archive and direct display devices.

B. OUTPUTS

4.2.1.4-C1 O1 Alarms
(To: 4.2.1.4-A1, Operations Personnel)

This output represents the signal to transfer operations personnel of off-normal conditions.

4.2.1.4-C1 O2 Status Indicators
(To: 4.2.1.4-A1, Operations Personnel)

This output represents the status of critical transfer parameters required to monitor the progress, safety, and readiness of the transfer.

4.2.1.4-C1 O3 LWTS Commands
(Operations Personnel, 4.2.1.4-A3)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C1 O4 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTIONAL REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C1 P1 Operator Control

(Ref: Engineering Judgment)
The operator shall be provided with the capability to continuously oversee and control the waste transfer operation. Automated functions shall have manual overrides.

4.2.1.4-C1 P2 Single Point Failures

(Ref: Derived, DOE Order 6430.1A, 1300-3.3)
The system shall not lose the ability to control critical functions as a result of a single point failure. Following a failure, the system shall permit the operator to ensure a safe and orderly shutdown of the system.

VII. INTERFACE REQUIREMENTS:

A. INPUTS

4.2.1.4-C1 I1 C1 Waste Characterization Data

N/A.

4.2.1.4-C1 I2 Operations Data for Transfer

TBD.

4.2.1.4-C1 I2 Issue 1 Required Analysis 1

The functions associated with the Instrumentation Upgrade portion of Project W-314 do not necessarily focus on the complete set of control and monitoring functions and requirements necessary for the transfer system. The Instrumentation and Waste Transfer upgrades will need to be closely coordinated to ensure that the functional requirements for all required control and monitoring are satisfied.

4.2.1.4-C1 I3 Raw Materials for TLW

N/A.

4.2.1.4-C1 I4 Reusable Materials for TLW

N/A.

4.2.1.4-C1 I5 Waste Transfer Data

N/A.

B. OUTPUTS

4.2.1.4-C1 O1 Alarms

4.2.1.4-C1 O1 C1 Critical Alarms

Critical alarms shall be presented ahead of all other alarms and be immediately apparent to operations personnel.

4.2.1.4-C1 02 Status Indicators

N/A.

4.2.1.4-C1 03 LWTS Commands

4.2.1.4-C1 03 C1 Initiation of Critical Functions

(Ref: Derived, DOE 5820.2A, Chap. 1, 3.b.(2).(k))
Critical functions, those that initiate the movement or processing of the waste, shall not be initiated without positive operator control.

4.2.1.4-C1 04 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C2

II. **FUNCTION TITLE:** Set-up and Maintain the LWTS

III. **FUNCTION DESCRIPTION:**

This function provides for those activities necessary for the initial installation and check-out (I&CO) of the transfer system, training of personnel, on-going maintenance, periodic tests and activities required to ensure the waste transfer system remains operational, pre-operational system acceptance tests and the activities to ensure the readiness of all supplies and utilities needed for the conduct of a liquid waste transfer.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C2 I1 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2 I2 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C2 I4 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. OUTPUTS

4.2.1.4-C2 O1 Operational LWTS
(To: 4.2.1.4-C3, 4.2.1.4-C4)

This output represents a waste transfer system ready to begin operations.

4.2.1.4-C2 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTIONAL REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

VII. INTERFACE REQUIREMENTS:

A. INPUTS

4.2.1.4-C2 I1 Raw Materials for TLW

N/A.

4.2.1.4-C2 I2 Reusable Materials for TLW

N/A.

4.2.1.4-C2 I3 LWTS Commands

N/A.

4.2.1.4-C2 I4 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C2 O1 Operational LWTS

N/A.

4.2.1.4-C2 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C2.1

II. **FUNCTION TITLE:** Train LWTS Personnel

III. **FUNCTION DESCRIPTION:**

This function provides for the qualification training of LWTS operators and maintenance personnel.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C2.1 I1 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.1 I2 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Set-up and Maintain Liquid Waste Transfer System function.

B. **OUTPUTS**

4.2.1.4-C2.1 O1 Qualified LTWS Personnel
(To: 4.2.1.4-C2.2)

Fully trained and qualified LWTS operators and maintenance personnel.

4.2.1.4-C2.1 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. **FUNCTION REQUIREMENTS:**

A. **CONSTRAINTS**

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C2.1 P1 Personnel Training

(Ref: Derived, DOE 5480.20; WAC 173-303, Section 330)
The transfer system shall be operated and maintained by personnel qualified in accordance with DOE 5480.20 and WAC 173-303, Section 330.

4.2.1.4-C2.1 P1 Issue 1 Required Analysis 1

It would be helpful to be more explicit as to the expected grade and/or training level of the personnel who will be operating and maintaining the transfer system. This provides limits to the system designer as to how complex the system can be.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C2.1 I1 Raw Materials for TLW

N/A.

4.2.1.4-C2.1 I2 Reusable Materials for TLW

N/A.

B. OUTPUTS

4.2.1.4-C2.1 O1 Qualified LWTS Personnel

N/A.

4.2.1.4-C2.1 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C2.2

II. **FUNCTION TITLE:** Upgrade LWTS

III. **FUNCTION DESCRIPTION:**

This function provides for the installation and check-out (I&CO) of the transfer system upgrade. This includes all activities to install the transfer system including dispositioning/modifying existing system elements, installing new hardware, and verifying the system meets requirements.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C2.2 I1 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.2 I2 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.2 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C2.2 I4 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

4.2.1.4-C2.2 I5 Qualified LWTS Personnel
(From: 4.2.1.4-C2.1)

Fully trained and qualified LWTS operators and maintenance personnel.

B. OUTPUTS

4.2.1.4-C2.2 O1 Upgraded LWTS
(To: 4.2.1.4-C2.3)

An upgraded LWTS.

4.2.1.4-C2.2 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C2.2 P1 Isolation of Existing Transfer System

(Ref: Engineering Judgment)
Upon completion of the installation of the waste transfer system upgrade, original transfer system elements which will be unused and can not meet system requirements shall be isolated.

4.2.1.4-C2.2 P2 Completion of Upgrade

(Ref: Derived, TPA-43-00)
The transfer system upgrade shall be completed in support of TPA milestone M-43-00.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C2.2 I1 Raw Materials for TLW

N/A.

4.2.1.4-C2.2 I2 Reusable Materials for TLW

N/A.

4.2.1.4-C2.2 I3 LWTS Commands

N/A.

4.2.1.4-C2.2 I4 Operations Data for Transfer

N/A.

4.2.1.4-C2.2 I5 Trained LWTS Personnel

N/A.

B. OUTPUTS

4.2.1.4-C2.2 O1 Upgraded LWTS

N/A.

4.2.1.4-C2.2 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C2.3

II. **FUNCTION TITLE:** Maintain LWTS

III. **FUNCTION DESCRIPTION:**

This function provides for the maintenance of the LWTS including periodic maintenance and testing to ensure operational integrity as well as the repair and/or replacement of specific system elements.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C2.3 I1 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.3 I2 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.3 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C2.3 I4 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

4.2.1.4-C2.3 I5 Upgraded LWTS
(From: 4.2.1.4-C2.2)

An upgraded LWTS.

B. **OUTPUTS**

4.2.1.4-C2.3 O1 Maintained LWTS
(To: 4.2.1.4-C2.4)

A working LWTS ready for verification.

4.2.1.4-C2.3 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. **CONSTRAINTS**

4.2.1.4-C2.3 C1 Maintenance

(Ref: DOE Order 5480.11, 9.j.(1).(d); HSRCM-1; WHC-CM-4-11)
Provisions shall be made for both radioactive and non-radioactive equipment maintenance to achieve the required performance levels of the system. The design of the system shall minimize the need for routine hands-on maintenance in contaminated or high dose-rate areas during service. Equipment that is expected to become contaminated during operation shall have provisions for both in-place maintenance and for removal to a separate maintenance facility. Portions of the equipment which are subject to being maintained remotely during preventative maintenance shall incorporate remote fasteners and/or other features to facilitate the task.

4.2.1.4-C2.3 C2 Mean Time to Repair (MTTR)

(Ref: Engineering Judgment)
The mean time to repair (MTTR) of the system shall be no greater than TBD hours.

4.2.1.4-C2.3 C2 Issue 1 Required Analysis 1

A specified MTTR will assist in guiding the complexity of the system design and supporting the required system availability. This parameter should be specified when the system concept matures. A calculated MTTR of the current system may provide a useful point of departure.

4.2.1.4-C2.3 C3 Testing

(Ref: DOE 6430.1A, 1300-3.6)
The design of the system shall have provisions for periodic testing of monitoring, surveillance, and alarm systems in accordance with DOE 6430.1A, 1300-3.6.

4.2.1.4-C2.3 C4 Preventative Maintenance and Inspection

(Ref: DOE 4330.4B; WAC 173-303, Section 320)
Preventative maintenance for the transfer system shall be programmed and managed in accordance with DOE 4330.4B and WAC 173-303, Section 320.

B. PERFORMANCE REQUIREMENTS

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C2.3 I1 Raw Materials for TLW

N/A.

4.2.1.4-C2.3 I2 Reusable Materials for TLW

N/A.

4.2.1.4-C2.3 I3 LWTS Commands

N/A.

4.2.1.4-C2.3 I4 Operations Data for Transfer

N/A.

4.2.1.4-C2.3 I5 Upgraded LWTS

N/A.

B. OUTPUTS

4.2.1.4-C2.3 O1 Maintained LWTS

N/A.

4.2.1.4-C2.3 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C2.4

II. **FUNCTION TITLE:** Verify LWTS

III. **FUNCTION DESCRIPTION:**

This function provides for the verification that the LWTS is ready for operational use. This includes setting up and verifying the transfer routing, configuring and verifying the control system and performing final acceptance tests to ensure the system is ready to conduct a waste transfer.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C2.4 I1 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.4 I2 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Set-up and Maintain Liquid Waste Transfer System function.

4.2.1.4-C2.4 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C2.4 I4 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

4.2.1.4-C2.4 I5 Maintained LWTS
(From: 4.2.1.4-C2.3)

A working LWTS ready for verification.

B. OUTPUTS

4.2.1.4-C2.4 O1 Operational LWTS

An operational liquid waste transfer system ready for use.

4.2.1.4-C2.4 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C2.4 P1 Transfer Route Verification

(Ref: Engineering Judgment)
Prior to the initiation of a waste transfer, the transfer route shall be configured and verified.

4.2.1.4-C2.4 P2 Control System Verification

(Ref: Engineering Judgment)
Prior to the initiation of a waste transfer, the correct configuration and functionality of the control and monitoring system shall be verified. This includes, but is not limited to, all safety monitoring equipment, valves and interlocks.

4.2.1.4-C2.4 P3 Transfer System Verification

(Ref: Engineering Judgment)
Prior to the initiation of a waste transfer, the correct operation of the complete transfer system shall be verified.

4.2.1.4-C2.4 P3.1 Pressure Checks

(Ref: Engineering Judgment)
Prior to the initiation of a waste transfer, the system shall be pressure tested to the requirements of ANSI/ASME B30.4 with respect to test type, test pressure, test duration and leak detection.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C2.4 I1 Raw Materials for TLW

N/A.

4.2.1.4-C2.4 I2 Reusable Materials for TLW

N/A.

4.2.1.4-C2.4 I3 LWTS Commands

N/A.

4.2.1.4-C2.4 I4 Operations Data for Transfer

N/A.

4.2.1.4-C2.4 I5 Maintained LWTS

N/A.

B. OUTPUTS

4.2.1.4-C2.4 O1 Operational LWTS

N/A.

4.2.1.4-C2.4 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C3

II. **FUNCTION TITLE:** Receive and Condition Liquid Waste (RCW)

III. **FUNCTION DESCRIPTION:**

This function provides for the receipt of liquid waste and, as required, the interim storage and conditioning of the waste.

IV. **ENABLING ASSUMPTIONS:**

Batching of the retrieved waste will be required to some extent to support efficient waste transfers.

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C3 I1 Retrieved Waste
(From: 4.2.1.3)

Waste extracted from a SST or received from a 200 area waste generator.

4.2.1.4-C3 I2 Waste Characterization Data
(From: 4.2.1.2)

All waste characterization data provided by the Characterize Waste function needed to ensure the safe handling of the waste.

4.2.1.4-C3 I3 Raw Materials for RCW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Receive and Condition Liquid Waste function.

4.2.1.4-C3 I4 Reusable Materials for RCW
(From: 4.2.3.6)

Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Receive and Condition Liquid Waste function.

4.2.1.4-C3 I5 Operational LWTS
(From: 4.2.1.4-C2)

An operation liquid waste transfer system ready for use.

4.2.1.4-C3 I6 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C3 I7 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. OUTPUTS

4.2.1.4-C3 O1 Waste for Transfer as Fluid
(To: 4.2.1.4-C4)

This output represents the conditioned waste ready for transfer to the DST system

4.2.1.4-C3 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTIONAL REQUIREMENTS:

A. CONSTRAINTS:

4.2.1.4-C3 C1 Corrosion

(Ref: Derived, DOE 5820.2A, Chap. 1, 3.b.(7).(c))
The chemistry of the waste shall be adjusted to control corrosion within the design limits of the system.

4.2.1.4-C3 C2 Additions to Waste

(Ref: Derived, DOE 5820.2A, Chap. 1, 3.b.(7).(d))
Treatment reagents shall not be placed in a tank without proven effective mitigation action if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, or otherwise fail.

B. PERFORMANCE REQUIREMENTS

VII. INTERFACE REQUIREMENTS:

A. INPUTS

4.2.1.4-C3 I1 Retrieved Waste

4.2.1.4-C3 I1 Issue 1 Required Analysis 1

It has not been determined how the SST waste retrieval projects will transport their waste to the WTS Upgrade interface. A trade study should be performed to determine the optimum solution taking into account the requirements of all applicable projects.

4.2.1.4-C3 I1 P1 Interim Storage Capacity

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The waste transfer system shall have the capability to store at least 300,000 (TBR) gallons of liquid waste.

4.2.1.4-C3 I1 P1 Issue 1 Required Analysis 1

A trade study is needed to assess: 1) the types of liquid waste expected to be received and the requirements to keep different wastes separate from one another (e.g., TRU and non-TRU waste), and 2) the optimum storage capacity based on the costs to make numerous small transfers vs. a lesser number of large quantity transfers, and 3) the expected SST waste retrieval rate.

4.2.1.4-C3 I1 C1 Waste Segregation

(Ref: Derived from DOE 6430.1A, 1300-8.4; Engineering judgement)
Retrieved wastes accepted for storage shall be segregated into compatible groups. Waste shall only be accepted if compatible storage is available.

4.2.1.4-C3 I2 Waste Characterization Data

N/A.

4.2.1.4-C3 I3 Raw Materials for RCW

N/A.

4.2.1.4-C3 I4 Reusable Materials for RCW

N/A.

4.2.1.4-C3 I5 Operational LWTS

N/A.

4.2.1.4-C3 I6 LWTS Commands

N/A.

4.2.1.4-C3 I7 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C3 O1 Waste for Transfer as Fluid

4.2.1.4-C3 O1 P1 Transferred Waste Characteristics

The characteristics of the waste shall be within the following parameters prior to transfer:

PARAMETER	VALUE
Max. Solid Content	30 percent
Max. Specific Gravity	1.5
Waste Temperature Range	80 - 240 deg. F
Flush Water Temperature Range	35 - 212 deg. F
Ph Range	7 to 14
Max. Viscosity	30 centipoise

4.2.1.4-C3 O1 P1 Issue 1 Required Analysis

These waste characteristic criteria are drawn from Project W-058. If it is assumed that they are valid, then the waste to be conditioned and transferred as a result of Project W-314 can not exceed the criteria established for W-058.

4.2.1.4-C3 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C4

II. **FUNCTION TITLE:** Move Liquid Waste (MLW)

III. **FUNCTION DESCRIPTION:**

This function provides for the movement of liquid waste in one of three modes: 1) conditioned waste for transfer to the DST system, 2) previously conditioned waste for transfer to the DST system, and 3) transfer of waste within the A-Farm complex. With the exception of waste transfers within the A-Farm complex, liquid waste will have been accumulated and conditioned (as required) prior to transfer.

IV. **ENABLING ASSUMPTIONS:**

Waste transfers within the A-Farm complex are direct transfers from one tank farm to another. Transfer functions within a specific tank farm are not within the scope of this function (or Project W-314).

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C4 I1 Waste for Transfer as Fluid
(From: 4.2.1.4-C3)

This output represents the conditioned waste ready for transfer to the DST system

4.2.1.4-C4 I2 Operational LWTS
(From: 4.2.1.4-C2)

An operational liquid waste transfer system ready for use.

4.2.1.4-C4 I3 Retrieved A-Farm Waste
(From: 4.2.1.3)

Liquid waste retrieved from an A-Farm complex DST.

4.2.1.4-C4 I4 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C4 I5 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.

4.2.1.4-C4 I6 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water) or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.

4.2.1.4-C4 I7 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. **OUTPUTS**

4.2.1.4-C4 O1 Waste to Storage
(To: 4.2.1.1)

Liquid waste ready for transfer into the DST system. This includes any line flushing solution required after the completion of a transfer.

4.2.1.4-C4 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

4.2.1.4-C4 O3 A-Farm Waste to Storage
(To: 4.2.1.3)

Liquid waste ready for input into an A-Farm DST. This includes any line flushing solution required after the completion of a transfer.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

4.2.1.4-C4 C1 Secondary Containment

(Ref: DOE 5820.2A, Chap. 1, 3.b.(2).(a); DOE 6430.1A, Sec. 1323-5.2)
The transfer system shall provide for secondary containment of the waste. Secondary containment systems shall be capable of containing liquids that leak into them from the primary system and shall be designed to permit retrieval of the interstitial liquid.

4.2.1.4-C4 C2 Waste Minimization

(Ref: DOE 5820.2A)
The waste transfer process shall minimize the production of secondary waste, including minimizing the introduction of additional waster into the DST system. Recycled supernatant shall be considered as a medium for dislodging processes that require water, flushing, or for lubrication of the internal surface of the transfer system.

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C4 P1 Line Clearing

(Ref: Engineering Judgment)
The transfer system shall minimize the potential for line fouling and plugging during the conduct of a transfer operation. Provisions shall be provided to clear a clogged or plugged line should this occur.

4.2.1.4-C4 P1.1 Transfer Rate

(Ref: Derived WHC-SD-W058-FDC-001, Rev. 0A; KEH Calculation W-058-002)
The liquid waste shall be transferred at a rate of no less than 6 (TBR) feet/sec to preclude waste settling.

4.2.1.4-C4 P1.1 Issue 1 Required Analysis 1

The rate of 6 feet/sec is based on the referenced calculation from Project W-058. This calculation did not address flow characteristics during ramp down and how this would affect solids settling in the pipeline. Further studies should be conducted to help assess how waste settling as a result of slower flow during ramp down could be reduced.

4.2.1.4-C4 P1.2 Waste Temperature

(Ref: Derived, Project W-058 WHC-SD-W058-FDC-001)
The transfer system shall be capable of transferring the liquid waste at a temperature of TBD with no greater than TBD degrees loss of temperature during the transfer.

4.2.1.4-C4 P1.2 Issue 1 Required Analysis 1

In the past, waste temperature has been perceived as significant towards maintaining the waste solids in solution. The actual temperature will vary by waste characterization, however, an acceptable delta temperature should be specified to drive out requirements for such elements as line insulation, trace heating, line pre-heating, and so forth.

4.2.1.4-C4 P2 Line Flushing

(Ref: Engineering Judgment, Current Practice)
Following the completion of a waste transfer, the transfer system shall be cleared by flushing with a quantity of TBD gallons of water or other suitable material equal to 1.5 (TBR) times the volume of the transfer path.

4.2.1.4-C4 P2 Issue 1 Required Analysis 1

Traditionally the lines are being flushed with water (new or reusable). The amount of water used appears to be dependent only upon the volume of the transfer path, typically at a ratio of 1.5 to 1. A trade study should be pursued to investigate flushing methods that would also be dependent on waste type and viscosity in support of better tank capacity management.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C4 I1 Waste for Transfer as Fluid

N/A.

4.2.1.4-C4 I2 Operational LWTS

N/A.

4.2.1.4-C4 I3 Retrieved A-Farm Waste

N/A.

4.2.1.4-C4 I4 LWTS Commands

N/A.

4.2.1.4-C4 I5 Raw Materials for TLW

N/A.

4.2.1.4-C4 I6 Reusable Materials for TLW

TBD.

4.2.1.4-C4 I6 Issue 1 Required Analysis 1

Based on the desire to minimize the quantity of additional waste produced as a result of the transfer process, a study should be conducted to assess how the lines should be flushed and with what. It may be desirable to recycle the waste dilutant material and use this substance to flush the lines. Additional food for thought is what the DST will do with the dilutant once the waste is condensed, and what the SST waste removal project will use for a sluicing agent.

4.2.1.4-C4 I7 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C4 O1 Waste to Storage

N/A.

4.2.1.4-C4 O2 Excess Facilities from TLW

N/A.

4.2.1.4-C4 O3 A-Farm Waste to Storage

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C4.1

II. **FUNCTION TITLE:** Move Waste from SST

III. **FUNCTION DESCRIPTION:**

This function provides for the transfer of liquid waste received from the SSTs and accumulated and conditioned as required from the "Receive and Condition Liquid Waste" function.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C4.1 I1 Waste for Transfer as Fluid
(From: 4.2.1.4-C3)

Accumulated liquid waste received from the 200 area SSTs and/or AWGs and conditioned as required for transfer.

4.2.1.4-C4.1 I2 Operational LWTS
(From: 4.2.1.4-C2)

An operational liquid waste transfer system ready for use.

4.2.1.4-C4.1 I3 Qualified LWTS Personnel
(From: 4.2.1.4-C2)

Fully trained and qualified LWTS operators and maintenance personnel.

4.2.1.4-C4.1 I4 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C4.1 I5 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.

4.2.1.4-C4.1 I6 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water) or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.

4.2.1.4-C4.1 I7 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. OUTPUTS

4.2.1.4-C4.1 O1 Waste to Storage
(To: 4.2.1.1)

Liquid waste ready for transfer into the DST system. This includes any line flushing solution required after the completion of a transfer.

4.2.1.4-C4.1 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C4.1 P1 Transfer Routing

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall provide for the transfer of liquid waste retrieved from SSTs located in the A-Farm, B-Farm, C-Farm, S-Farm, T-Farm, TY-Farm and U-Farm into the DST system.

4.2.1.4-C4.1 P2 Transfer System Capacity

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall be capable of transferring 6 million (TBR) gallons per month of conditioned liquid waste from the SSTs into the DST system.

4.2.1.4-C4.1 P2 Issue 1 Required Analysis 1

The required transfer capability will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C4.1 I1 Transferable Liquid Waste

N/A.

4.2.1.4-C4.1 I2 Operational LWTS

N/A.

4.2.1.4-C4.1 I3 Qualified Operators

N/A.

4.2.1.4-C4.1 I4 LWTS Commands

N/A.

4.2.1.4-C4.1 I5 Raw Materials for TLW

N/A.

4.2.1.4-C4.1 I6 Reusable Materials for TLW

N/A.

4.2.1.4-C4.1 I7 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C4.1 O1 Waste to Storage

N/A.

4.2.1.4-C4.1 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C4.2

II. **FUNCTION TITLE:** Move Liquid Waste from the Area Waste Generators

III. **FUNCTION DESCRIPTION:**

This function provides for the transfer of liquid waste received from the 200 area waste generators and accumulated and conditioned as required from the Receive and Condition Liquid Waste function.

IV. **ENABLING ASSUMPTIONS:**

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C4.2 I1 Waste for Transfer as Fluid
(From: 4.2.1.4-C3)

This output represents the conditioned waste ready for transfer to the DST system

4.2.1.4-C4.2 I2 Operational LWTS
(From: 4.2.1.4-C2)

An operational liquid waste transfer system ready for use.

4.2.1.4-C4.2 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C4.2 I4 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.

4.2.1.4-C4.2 I5 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water) or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.

4.2.1.4-C4.2 I6 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. OUTPUTS

4.2.1.4-C4.2 O1 Waste to Storage
(To: 4.2.1.1)

Liquid waste ready for transfer into the DST system. This includes any line flushing solution required after the completion of a transfer.

4.2.1.4-C4.2 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C4.2 P1 Transfer Routing

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall provide for the transfer of liquid waste received from AWGs into the DST system.

4.2.1.4-C4.2 P1 Issue 1 Required Analysis 1

Based on the expected site operations during the site remediation effort, the specific AWGs to be tied in should be specified, whether this is all plants and laboratories or only specific ones.

4.2.1.4-C4.2 P2 Transfer System Capacity

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall be capable of transferring 6 million (TBR) gallons per month of conditioned liquid waste from the 200 Area generators into the DST system.

4.2.1.4-C4.2 P2 Issue 1 Required Analysis 1

The required transfer capability will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C4.2 I1 Transferable Liquid Waste

N/A.

4.2.1.4-C4.2 I2 Operational LWTS

N/A.

4.2.1.4-C4.2 I3 LWTS Commands

N/A.

4.2.1.4-C4.2 I4 Raw Materials for TLW

N/A.

4.2.1.4-C4.2 I5 Reusable Materials for TLW

N/A.

4.2.1.4-C4.2 I6 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C4.2 O1 Waste to Storage

N/A.

4.2.1.4-C4.2 O2 Excess Facilities from TLW

N/A.

I. **FUNCTION ID NUMBER:** 4.2.1.4-C4.3

II. **FUNCTION TITLE:** Move Liquid Waste within the A-Farm

III. **FUNCTION DESCRIPTION:**

This function provides for the transfer of liquid waste within the A-Farm DST complex. Transfers consist of moving waste from one A-Farm tank farm to another, generally in support of such activities as waste consolidation and pre-processing prior to the final disposition of the waste.

IV. **ENABLING ASSUMPTIONS:**

A. Waste transfers within the A-Farm complex are direct transfers from one tank farm to another. Transfer functions within a specific tank farm are not within the scope of this function (or Project W-314).

B. Any required waste conditioning will be performed within the originating DST and is not within the scope of this function.

V. **INTERFACES:**

A. **INPUTS**

4.2.1.4-C4.3 I1 Retrieved A-Farm Waste
(From 4.2.1.3)

Liquid waste retrieved from an A-Farm complex DST.

4.2.1.4-C4.3 I2 Operational LWTS
(From: 4.2.1.4-C2)

An operational liquid waste transfer system ready for use.

4.2.1.4-C4.3 I3 LWTS Commands
(From: 4.2.1.4-C1)

Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.

4.2.1.4-C4.3 I4 Raw Materials for TLW
(From: 2.)

Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.

4.2.1.4-C4.3 I5 Reusable Materials for TLW
(From: 4.2.3.6)

Equipment, chemicals (including water) or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.

4.2.1.4-C4.3 I6 Operations Data for Transfer
(From: External)

Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.

B. OUTPUTS

4.2.1.4-C4.3 O1 A-Farm Waste to Storage
(To: 4.2.1.3)

Liquid waste ready for input into an A-Farm DST. This includes any line flushing solution required after the completion of a transfer.

4.2.1.4-C4.3 O2 Excess Facilities from TLW
(To: 4.2.3.5)

This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.

VI. FUNCTION REQUIREMENTS:

A. CONSTRAINTS

B. PERFORMANCE REQUIREMENTS

4.2.1.4-C4.3 P1 Transfer System Routing

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall provide for the transfer of liquid waste between DST farms located within the A-Farm. Transfer system routing shall provide a means for a tank's contents to be transferred into any other tank.

4.2.1.4-C4.3 P2 Transfer System Capacity

(Ref: Engineering Study WHC-SD-W314C-ES-001)
The transfer system shall be capable of transferring TBD gallons per month of conditioned liquid waste within the A-Farm system

4.2.1.4-C4.3 P2 Issue 1 Required Analysis 1

The required transfer capability of the A-Farm transfer system will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values. In this instance, the near-term fallback may be to use the capacity provide by the current lines as the baseline until additional studies can be conducted.

VII. INTERFACE REQUIREMENTS

A. INPUTS

4.2.1.4-C4.3 I1 Retrieved A-Farm Waste

N/A.

4.2.1.4-C4.3 I2 Operational LWTS

N/A.

4.2.1.4-C4.3 I3 LWTS Commands

N/A.

4.2.1.4-C4.3 I4 Raw Materials for TLW

N/A.

4.2.1.4-C4.3 I5 Reusable Materials for TLW

N/A.

4.2.1.4-C4.3 I6 Operations Data for Transfer

N/A.

B. OUTPUTS

4.2.1.4-C4.3 O1 A-Farm Waste to Storage

N/A.

4.2.1.4-C4.3 O2 Excess Facilities from TLW

N/A.

2.3 INTERFACE IDENTIFICATION

Table C2-1 below lists the interfaces of the WTS Upgrade functions. Interfaces are the inputs and outputs of the defined functions. An input is anything acted upon by the function to produce a desired output(s); and output is anything that leaves the function after it has been acted upon by the function. Interfaces with other upgrades provided by Project W-314 will be identified as the functions for those upgrades become available.

NOTE: Functions designated TWRS 4.2.x.x (for example, TWRS 4.2.1.1) are fourth level functions from DOE/RL-92-60. See Figure 2-1, in the main body of this document, for the TWRS function hierarchy.

TABLE C2-1. WASTE TRANSFER SYSTEM UPGRADE INTERFACES (3 sheets)

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Retrieved Waste Waste extracted from a SST or received from a 200 area waste generator.	4.2.1.3	4.2.1.4-C0, 4.2.1.4-C3
Waste Characterization Data All waste characterization data provided by the Characterize Waste function needed to ensure the safe handling of the waste.	4.2.1.2	4.2.1.4-C0, 4.2.1.4-C1, 4.2.1.4-C3
Raw Materials for TLW Any material (e.g., steam, water, air, electricity, process chemical, etc.) needed from outside TWRS for performing the Transfer Liquid Waste function.	2.	4.2.1.4-C0, 4.2.1.4-C1, 4.2.1.4-C2, 4.2.1.4-C2.1, 4.2.1.4-C2.2, 4.2.1.4-C2.3, 4.2.1.4-C2.4, 4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3
Reusable Materials for TLW Equipment, chemicals (including water), or facilities that have fulfilled their original purpose and are now available for use by the Transfer Liquid Waste function.	4.2.3.6	4.2.1.4-C0, 4.2.1.4-C1, 4.2.1.4-C2, 4.2.1.4-C2.1, 4.2.1.4-C2.2, 4.2.1.4-C2.3, 4.2.1.4-C2.4, 4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3
Retrieved A-Farm Waste Liquid waste retrieved from an A-Farm DST for inter-farm transfer.	4.2.1.3	4.2.1.4-C0, 4.2.1.4-C4, 4.2.1.4-C4.3

TABLE C2-1. WASTE TRANSFER SYSTEM UPGRADE INTERFACES (3 sheets)

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Operations Data for Transfer Information received externally from the TLW function necessary to conduct a waste transfer operation. This may include operational instructions, tank status, waste volume to be processed, etc.	External	4.2.1.4-C0, 4.2.1.4-C1, 4.2.1.4-C2, 4.2.1.4-C2.2, 4.2.1.4-C2.3, 4.2.1.4-C2.4, 4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3
Waste Transfer Data These are networked data signals which can be read by archive and direct display devices.	4.2.1.4-A1	4.2.1.4-C0, 4.2.1.4-C1
Waste to Storage Liquid waste ready for transfer into the DST system. This includes any line flushing solution required after the completion of a transfer	4.2.1.4-C0, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2	4.2.1.1
Excess Facilities from TLW This output represents excess facilities that have served their purpose for the Transfer Liquid Waste function and are now available for reuse or deactivation, as appropriate.	4.2.1.4-C0, 4.2.1.4-C1, 4.2.1.4-C2, 4.2.1.4-C2.2, 4.2.1.4-C2.3, 4.2.1.4-C2.4, 4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3	4.2.3.5
A-Farm Waste to Storage Waste received from an A-Farm DST ready for input into another A-Farm DST.	4.2.1.4-C0, 4.2.1.4-C4, 4.2.1.4-C4.3	4.2.1.1
Alarms This output represents the signal to transfer operations personnel of off-normal conditions.	4.2.1.4-C1	4.2.1.4-A1, Operations Personnel
Status Indicators This output represents the status of critical transfer parameters required to monitor the progress, safety, and readiness of the transfer.	4.2.1.4-C1	4.2.1.4-A1, Operations Personnel

TABLE C2-1. WASTE TRANSFER SYSTEM UPGRADE INTERFACES (3 sheets)

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
LWTS Commands Control commands (e.g., initiate/halt pumping) to elements of the liquid waste transfer system. These commands could be manual (i.e., voice commands to operations personnel) or internal to the design of the transfer system.	4.2.1.4-C1	4.2.1.4-C2, 4.2.1.4-C2.2, 4.2.1.4-C2.3, 4.2.1.4-C2.4, 4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3, 4.2.1.4-A3, Operations Personnel
Operational LWTS This output represents a waste transfer system ready to begin operations.	4.2.1.4-C2, 4.2.1.4-C2.4	4.2.1.4-C3, 4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2, 4.2.1.4-C4.3
Qualified LWTS Personnel Fully trained and qualified LWTS operators and maintenance personnel.	4.2.1.4-C2.1	4.2.1.4-C2.2
Upgraded LWTS An upgraded LWTS.	4.2.1.4-C2.2	4.2.1.4-C2.3
Maintained LWTS A working LWTS ready for verification.	4.2.1.4-C2.3	4.2.1.4-C2.4
Waste for Transfer as Fluid This output represents the conditioned waste ready for transfer to the DST system	4.2.1.4-C3	4.2.1.4-C4, 4.2.1.4-C4.1, 4.2.1.4-C4.2

2.4 FUNCTIONAL AND INTERFACE REQUIREMENTS ALLOCATION

Each of the FDSs contained in this appendix includes the constraints and performance requirements that are allocated to the functions and interfaces of the WTS Upgrade. Table C2-2 below provides a list of DOE and RL Orders, as well as other regulations, referenced in the FDSs. The table does not include the requirements derived from TPA Milestones, engineering studies, and engineering judgement. See Section 3.0 in the main body of this document for additional instructions regarding the application of the requirements listed below.

TABLE C2-2. WASTE TRANSFER SYSTEM UPGRADES REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES
10 CFR 61.40, 43, *Licensing Requirements for Land Disposal of Radioactive Waste*	4.2.1.4-C0	
DOE Order 4330.4B, *Maintenance Management Program*	4.2.1.4-C2.3	
DOE Order 5480.11, *Radiation Protection for Occupational Workers*	4.2.1.4-C0	
DOE Order 5480.11, 9.j.(1)(d)	4.2.1.4-C0 4.2.1.4-C2.3	
DOE Order 5480.20, *Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities*	4.2.1.4-C2.1	
DOE Order 5820.2A, *Radioactive Waste Management*	4.2.1.4-C4	
DOE Order 5820.2A, Chapter I	4.2.1.4-C0	
DOE Order 5820.2A, Chapter I, 3.a.(1)	4.2.1.4-C0	
DOE Order 5820.2A, Chapter I, 3.b.(2)(a)	4.2.1.4-C4	
DOE Order 5820.2A, Chapter I, 3.b.(2)(k)		LWTS Commands
DOE Order 5820.2A, Chapter I, 3.b.(7)	4.2.1.4-C0 4.2.1.4-C3	
DOE Order 5820.2A, Chapter II	4.2.1.4-C0	

TABLE C2-2. WASTE TRANSFER SYSTEM UPGRADES REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES
DOE Order 6430.1A, *General Design Criteria*	4.2.1.4-C0	Excess Facilities from TLW
DOE Order 6430.1A, 1300-3.3	4.2.1.4-C1	
DOE Order 6430.1A, 1300-3.6	4.2.1.4-C2.3	
DOE Order 6430.1A, 1300-8.4		Retrieved Waste
DOE Order 6430.1A, 1323-5.2	4.2.1.4-C4	
RLID 5820.2A, *Radioactive Waste Management*, Chapter I	4.2.1.4-C0	
RLID 5820.2A, Chapter II	4.2.1.4-C0	
RLID 5820.2A, 7.a.1	4.2.1.4-C0	
RLID 5820.2A, 7.a.2	4.2.1.4-C0	
RLID 5820.2A, 7.b.5	4.2.1.4-C0	
WAC 173-303, *Dangerous Waste Regulations*, Section 320	4.2.1.4-C2.3	
WAC 173-303, Section 330	4.2.1.4-C2.1	
WAC 173-303, Section 640	4.2.1.4-C0	
WHC-CM-4-11, *ALARA Program Manual*	4.2.1.4-C0 4.2.1.4-C2.3	
HSRCM-1, *Hanford Site Radiological Control Manual*	4.2.1.4-C0 4.2.1.4-C2.3	
WHC-SD-WM-OCD-15, *Tank Farm Waste Compatibility Program*, page 7	4.2.1.4-C0	

2.5 SUMMARY OF ISSUES

Table C2-3 contains a summary listing of all requirement issues identified in the function description sheets.

TABLE C2-3. REQUIREMENT ISSUE SUMMARY (3 sheets)

REQUIREMENT NUMBER	ISSUE
4.2.1.4-CO C2	The required SST transfer system service life estimates are based on the SST waste retrieval schedule in the TPA. This estimate may need to be modified in order to reflect a desired design margin and the requirements of other potential system users.
4.2.1.4-CO C3	The required DST transfer system service life estimates are based on the SST waste retrieval and the waste processing schedules in the TPA. These TPA milestones indicate that waste vitrification must be complete by December 2028. This estimate may need to be modified in order to reflect a desired design margin and the requirements of other potential system users. Additionally, this date should be consistent with other projects, such as W-058.
4.2.1.4-CO P1	A meaningful system availability figure is important as it aids in guiding the overall complexity and robustness of the transfer system design. Additionally, it is key in the calculation of the overall transfer capacity required for the system. For example, the transfer capacity may have to be increased if the system is only available 10 percent of the time. This tentative availability number provided should be revised as the system concept matures.
4.2.1.4-CO I1 P1	The characterization of the waste to be received (including dilution ratio) is not known at this time. The performance requirement stated above represents the best engineering estimate that can be made at this time.
4.2.1.4-CO I1 P1	The expected nature of the waste and the way it will interface with the Transfer Liquid Waste function is unknown at this time. Specific requirements relating to the interface will need to be deferred until better characterization data is available. Close project integration will be necessary to insure the interface chosen is optimized for a true system solution.
4.2.1.4-C1 I2	The functions associated with the Instrumentation Upgrade portion of Project W-314 do not necessarily focus on the complete set of control and monitoring functions and requirements necessary for the transfer system. The Instrumentation and Waste Transfer upgrades will need to be closely coordinated to ensure that the functional requirements for all required control and monitoring are satisfied.
4.2.1.4-C2.1 P1	It would be helpful to be more explicit as to the expected grade and/or training level of the personnel who will be operating and maintaining the transfer system. This provides limits to the system designer as to how complex the system can be.

TABLE C2-3. REQUIREMENT ISSUE SUMMARY (3 sheets)

REQUIREMENT NUMBER	ISSUE
4.2.1.4-C2.4 C2	A specified MTTR will assist in guiding the complexity of the system design and supporting the required system availability. This parameter should be specified when the system concept matures. A calculated MTTR of the current system may provide a useful point of departure.
4.2.1.4-C3 I1	It has not been determined how the SST waste retrieval projects will transport their waste to the WTS Upgrade interface. A trade study should be performed to determine the optimum solution taking into account the requirements of all applicable projects.
4.2.1.4-C3 I1 P1	A trade study is needed to assess: 1) the types of liquid waste expected to be received and the requirements to keep different wastes separate from one another (e.g., TRU and non-TRU waste), and 2) the optimum storage capacity based on the costs to make numerous small transfers vs. a lesser number of large quantity transfers.
4.2.1.4-C3 O1 P1	These waste characteristic criteria are drawn from Project W-058. If it is assumed that they are valid, then the waste to be conditioned and transferred as a result of Project W-314 can not exceed the criteria established for W-058.
4.2.1.4-C4 P1.1	The rate of 6 feet/sec is based on data derived from Project W-058. Should the underlying assumptions of that study change, such as pipe size, waste characteristics, etc., then the value of this requirement may have to be updated.
4.2.1.4-C4 P1.2	In the past, waste temperature has been perceived as significant towards maintaining the waste solids in solution. The actual temperature will vary by waste characterization, however, an acceptable delta temperature should be specified to drive out requirements for such elements as line insulation, trace heating, line pre-heating, and so forth.
4.2.1.4-C4 P2	Traditionally the lines are being flushed with water (new or reusable). The amount of water used appears to be dependent only upon the volume if the transfer path, typically at a ratio of 1.5 to 1. A trade study should be pursued to investigate flushing methods that would also be dependent on waste type and viscosity in support of better tank capacity management.
4.2.1.4-C4 I6	Based on the desire to minimize the quantity of additional waste produced as a result of the transfer process, a study should be conducted to assess how the lines should be flushed and with what. It may be desirable to recycle the waste dilutant material and use this substance to flush the lines. Additional food for thought is what the DST will do with the dilutant once the waste is condensed, and what the SST waste removal project will use for a sluicing agent.

TABLE C2-3. REQUIREMENT ISSUE SUMMARY (3 sheets)

REQUIREMENT NUMBER	ISSUE
4.2.1.4-C4.1 P2	The required transfer capability will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values.
4.2.1.4-C4.2 P1	Based on the expected site operations during the site remediation effort, the specific AWGs to be tied in should be specified, whether this is all plants and laboratories or only specific ones.
4.2.1.4-C4.2 P2	The required transfer capability will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values.
4.2.1.4-C4.3 P2	The required transfer capability of the A-Farm transfer system will be a function of the TPA schedule, the required system availability, the total amount of waste to be transferred, the expected dilution ratio and the required quantity of flushing solution. This value will have to be determined once the design concept has matured sufficiently to determine estimates for these values. In this instance, the near-term fallback may be to use the capacity provide by the current lines as the baseline until additional studies can be conducted.

2.6 ACRONYMS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWG	Area Waste Generator
DOE	Department of Energy
DST	Double-Shell Tank
FDS	Function Description Sheet
HLW	High Level Waste
KEH	Kaiser Engineers Hanford
LWTS	Liquid Waste Transfer System
LLW	Low Level Waste
MLW	Move Liquid Waste
MTTR	Mean Time To Repair
N/A	In this document, "N/A" means that the applicable description was already provided elsewhere.
PFP	Plutonium Finishing Plant
RCW	Receive And Condition Waste
SST	Single-Shell Tank
TBD	To Be Determined
TBR	To Be Revised
TLW	Transfer Liquid Waste
TPA	Tri-Party Agreement
TRU	Transuranic
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WTS	Waste Transfer System

APPENDIX D

FUNCTIONS AND REQUIREMENTS FOR TANK FARM ELECTRICAL UPGRADE

NOTE: The requirements presented in this appendix are binding.

Table of Contents

Tables

Figures

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of the Tank Farm Electrical Upgrades is to restore the electrical power distribution systems to an acceptable design basis, meet codes and requirements, and meet the requirements of the Tank Waste Remediation System mission. The need arises due to safety and reliability concerns with the older equipment, power requirements for future projects, operations and maintenance accessibility to existing equipment, and to improve overall system efficiency by eliminating partially loaded or unused equipment.

1.2 SCOPE

The boundaries for Tank Farms Electrical Upgrades are defined at the high voltage side of the 13.8 kV/480 v transformers (including the transformers) that supply power to the tank farms and includes all equipment necessary to distribute the power to the loads in the farm. The scope of the project does not include upgrading the actual loads in the farms. There is currently an on-going project, W-322 (242-S Substation Replacement/Upgrade), which replaces oversized/unused pole and pad-mounted transformers with a centrally located substation in the 200 West Area. This new substation is intended to service the S and U farm complexes and will only provide an upgraded substation for these farms. The Tank Farms Electrical Upgrades portion of W-314 will address the balance of the distribution system from the substation to the final loads in the S and U tank farm facilities. The Tank Farms Electrical Upgrades is also intending to use the same substation design for the remaining farms in order to supply those farms with power. There are other ongoing projects that are further along in design that will address their own power needs within the tank farms. Tank Farms Electrical Upgrades project will interface with these projects to ensure clear boundaries are defined and that power needs are met, whether by the specific projects or by W-314 Electrical Upgrades (Ref. W-314 Interface Document, D. L. Mcgrew). Current schedule as per the Tri-Party Agreement shows Electrical Upgrades to be complete and operation to begin in June 2005.

This electrical upgrades project proposes to change out a variety of failing or failed electrical distribution components and to replace a number of components that have exceeded or are near the end of their design life. Maintenance and operations of the electrical equipment is also a consideration of this project. A majority of the electrical equipment that serves the farms are located in contamination zones. The project proposes to place modern and easily accessible and maintainable equipment in structures and areas outside the contaminated zones where possible. The project will also bring the tank farms electrical distribution system within the bounds of current codes and standards.

The scope and boundaries for the W-314 electrical upgrades are detailed below:

- To upgrade power to all facilities associated with and located in the Tank Farms boundaries.

- Upgrading the electrical distribution system downstream of the new substation provided by Project W-322, from the downstream side of the 480 volt loadcenter breakers to the actual loads.

- For new substation design, to include the tap point on the existing 13.8 KV distribution system through the substation and on to the actual load. This may include installation of additional lines to feed the substations based on their location with respect to existing lines.

- In areas where the heat load is increased by the installation of equipment due to this project, the project will provide the additional cooling required to maintain equipment operability.

- Provide for the removal/demolition and disposal of the equipment it obsoletes and or replaces. Abandonment in-place may be allowed on a limited basis (ie. buried cable and wire runs)

- Electrical equipment that has been previously abandoned will be evaluated on a case by case basis for removal.

- Provide fire protection to new facilities introduced by this project. Provide fire protection to existing facilities that may require additional fire protection due to installation of equipment by this project.

- Provide as-builting of all existing drawings that are affected by project W-314 Electrical Upgrades.

- Provide labeling of circuits, raceways and wiring components installed by this project.

- Provide grounding for new electrical installations by this project.

- Provide back-up power as required to supply tank farm loads.

2.0 ELECTRICAL DISTRIBUTION SYSTEM UPGRADES FUNCTIONS AND REQUIREMENTS

Specific functions and requirements were developed for Project W-314. This appendix documents the Tank Farms Electrical System Upgrades functions and requirements to meet the requirements of DOE/RL-93-0106, Annex 2, *TWRS Systems Engineering Management Plan*. Each project-specific function is decomposed from a TWRS fourth-level function as identified in DOE/RL-92-60 Rev. 1, *Tank Waste Remediation System Functions and Requirements*.

The functions, requirements, and interfaces identified will be used to develop a project design concept and will be further refined to provide a basis for detailed design.

The TWRS Systems Engineering process will continue as described in DOE/RL-93-0106, Annex 2. As each step in the process is completed, the functions and requirements identified for the Electrical Systems Upgrade will be reviewed to assure that they maintain continuity with the TWRS functions

and requirements.

Section 2.1 of this appendix demonstrates the hierarchy of the Tank Farms Electrical Distribution Upgrades functions as they are decomposed from the TWRS fourth-level functions. Section 2.2 defines the project specific functions as well as identifies the interfaces on function description sheets. Section 2.3 defines the functional interfaces and section 2.4 lists the requirements allocated to the functions and interfaces of the Electrical Upgrades project.

2.1 FUNCTION HIERARCHY

Each function identified for the Electrical System Upgrade is given a number of the format 4.2.i.j-Dx (or -Dx.y or -Dx.y.z). The first part of the number, 4.2.i.j, is the number of the TWRS fourth-level function from which the project-level function was decomposed. The "-D" indicates that it is a function allocated to the Electrical Systems Upgrade. The "x", "x.y", or "x.y.z" completes the unique number within each "4.2.i.j" group. For example, 4.2.1.1-D1 indicates a function decomposed from the TWRS function 4.2.1.1 and allocated to the Electrical System Upgrade; 4.2.1.1-D1.1 indicates a subfunction of 4.2.1.1-D1.

Figure D2-1 illustrates the hierarchy of the Tank Farms Electrical System Upgrade functions as decomposed from the TWRS fourth-level functions. The dotted line between the fourth-level functions and the Electrical System Upgrade functions represents missing levels which will be developed as the systems engineering process continues. The Function Description Sheets in section 2.2 define the assumptions that enable the decomposition of the fourth-level TWRS function to the project level.

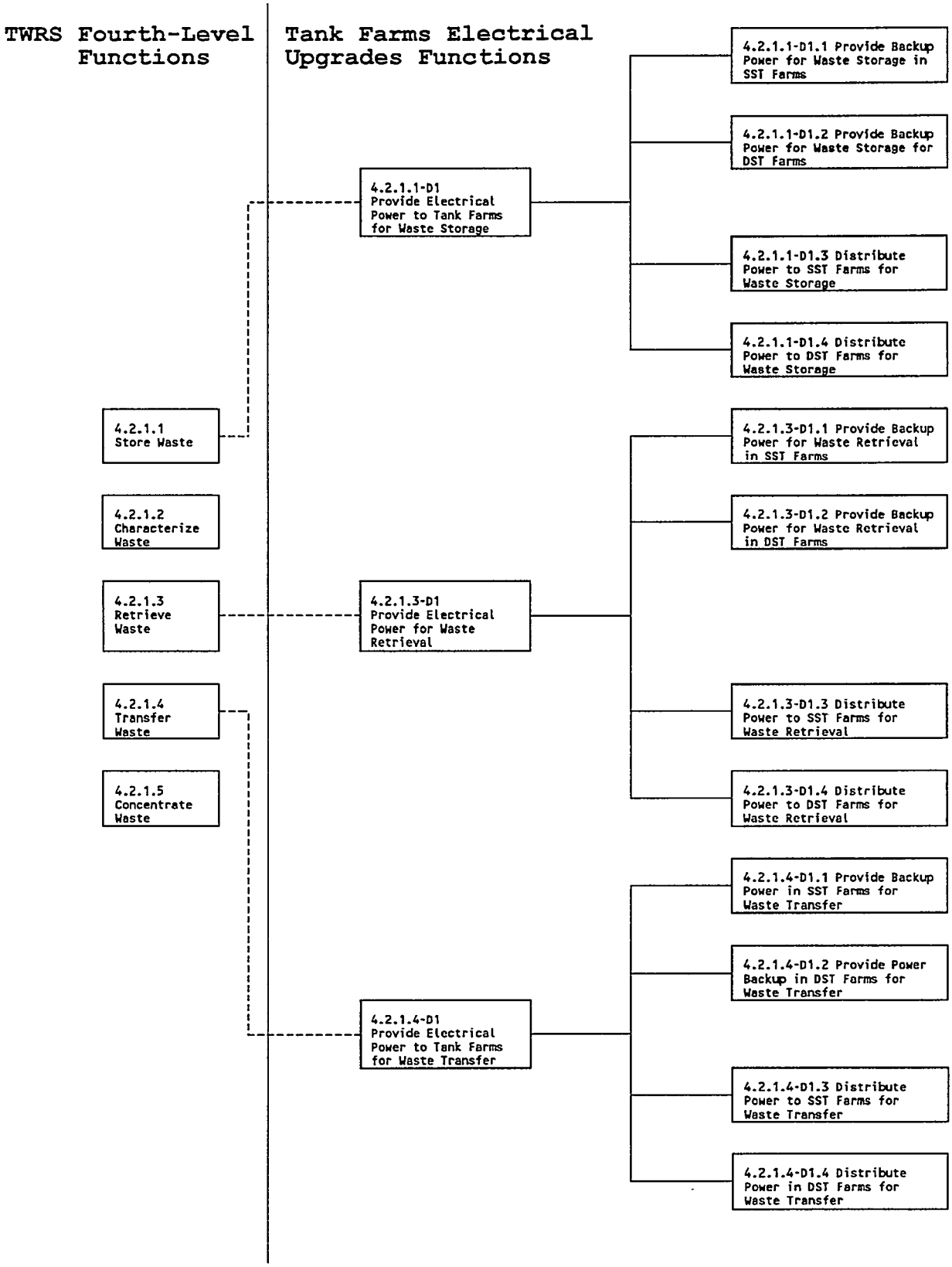


Figure D2-1 Electrical System Function Hierarchy

2.2 FUNCTION DESCRIPTION SHEETS

A Function Description Sheet is provided for each of the functions identified for the Tank Farms Electrical Upgrades Project. The Function Description Sheets provide descriptive information on the functions, as well as identification of enabling assumptions, interfaces, function requirements, and interface requirements. The sheets were prepared according to the format used in DOE/RL-92-60.

I. Function ID Number

A unique identification number for each function of the TWRS function tree. As indicated, the numbering scheme is based on using a 4.2. at the top level of the TWRS tree, a 4.2.i at the next level, a 4.2.i.j at the next level and so forth.

II. Function Title

A short description used to identify the function, usually in terms of a verb followed by a noun or a noun phrase.

III. Function Definition

A function is a primary statement of purpose; a definition of what a system or subsystem must accomplish to meet the overall mission. The function definition is a brief description of what this particular function must accomplish, often including the scope of applicability.

IV. Interfaces

A. Inputs

Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

B. Outputs

Anything that leaves the function after it has been acted upon by that function.

V. Function Requirements

A qualitative or quantitative statement of how well a function must be performed. Function requirements may be one of two types: Performance Requirements or Constraints.

The numbering conversion used for the identification of requirements in these tables is as follows:

4.2.1 P1 is the first performance requirement (P) allocated to function 4.2.1;
4.2.1 C1 is the first constraint (C) allocated to function 4.2.1; and
4.2.1 O1 P1 would be the first performance requirement allocated to output number O1 from function 4.2.1.
4.2.1 I3 C1 is the first constraint allocated to input number I3 to function 4.2.1.

Performance Requirements

Requirements imposed upon the function by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

Issues

If the requirements are inadequate, if they conflict with other requirements if they are not yet allocable, or if they are likely to change, an issue should be identified.

Required Analysis

Any activity, study, negotiation etc. that is necessary to resolve the "Issue".

Constraints

Requirements imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders).

Issues

If the requirements are inadequate, not yet allocable, or likely to change, an issue should be identified.

Required Analysis

Any activity, study, negotiation etc. that is necessary to resolve the "Issue".

VI. Interface Requirements

A requirement that applies to the inputs to, or outputs from, a function. Interface requirements are either Constraints or Performance Requirements, depending upon their origin.

Performance Requirements

Requirements imposed upon the interface by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

Issues

If the requirements are inadequate, if they conflict with other requirements, if they are not yet allocable, or if they are likely to change, an issue should be identified.

Required Analysis

Any activity, study, negotiation etc. that is necessary to resolve the "Issue".

Constraints

Requirements imposed upon the interface by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders).

Issues

If the requirements are inadequate, not yet allocable, or likely to change, an issue should be identified.

Required Analysis

Any activity, study, negotiation etc. that is necessary to resolve the "Issue".

VII. Expected System Performance

The TWRS Program is operating under the assumption that a planning basis does exist, as captured within the Tri-Party Agreement. Process flowsheets representative of this planning basis have been developed and the results (in the form of mass flow) are expressed as expected system performance.

As the system definition phase evolves into a more detailed design phase and more defensible analyses are conducted, confidence in the expected system performance values will increase. Eventually the expected system performance values will be converted into performance requirements and allocated to the appropriate functions and interfaces.

I. **FUNCTION ID NUMBER:** 4.2.1.1-D1

II. **FUNCTION TITLE:** Provide Electrical Power to the Tank Farms for Waste Storage

III. **FUNCTION DEFINITION:**

Provide electrical power from the existing utility distribution system to the tank farms to support safe storage of the wastes. This includes providing back-up power (where applicable) and distributing power to DST farms and SST farms for existing and future loads. The loads include equipment that supports the monitoring, containment and mixing of the tank wastes.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

Enabling Assumptions

1. Waste will continue to be stored in existing tanks in the tank farms until removed for final processing.
2. Equipment to support monitoring and confinement will continue to require electrical power in order to perform their functions during waste storage.
3. Tank farms will continue to require electrical power during period while waste is stored in tanks until final closure.
4. Safety class equipment will be identified.

IV. **INTERFACES**

A. INPUTS

4.2.1.1-D1 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.1-D1 I2 Load Data From: EXT

Information on the existing and future tank farm equipment with respect to power requirements (motor sizes, voltage requirements, etc.)

B. OUTPUTS

4.2.1.1-D1 O1 Alternate Power To: 4.2.1.1-D1.3
4.2.1.1-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

4.2.1.1-D1 02 Generated Power To: 4.2.1.1-D1.3
4.2.1.1-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the loads identified as requiring back-up power.

4.2.1.1-D1 03 Electrical Power To: 4.2.1.1

Electrical power taken from the utility system and distributed to the respective tank farm loads.

4.2.1.1-D1 04 Excess Equipment To: 4.2.3.4

Obsolete equipment that has been removed or replaced by the upgraded electrical system.

4.2.1.1-D1 05 Reusable Materials To: 4.2.3.6

Materials and equipment no longer required by the electrical upgrades project but suitable for reuse by TWRS or other programs.

V. FUNCTION REQUIREMENTS

See Table D2-2

VI. INTERFACE REQUIREMENTS

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.1-D1.1

II. **FUNCTION TITLE:** Provide back-up power for waste storage in SST farms

III. **FUNCTION DEFINITION:**

Provide back-up power to loads supporting waste storage in SST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing or as long as the loads are identified as requiring back-up power.

IV. **INTERFACES**

A. INPUTS

4.2.1.1-D1.1 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.1-D1.1 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.1-D1.1 O1 Generated Power To: 4.2.1.1-D1.3

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.1-D1.1 O2 Alternate Power To: 4.2.1.1-D1.3
4.2.1.1-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

4.2.1.1-D1.1 I2 Safety Class Power

4.2.1.1-D1.1 I2 Issue 1

The latest revision of the Interim Safety Equipment List for the Single Shell Tanks state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Single Shell Tank Farms include tank temperature instrumentation and tank liquid-level instrumentation. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads.

For the Single Shell Tanks, the document designates the active ventilation exhaust radiation monitoring system as safety class 2. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

The present electrical system is designated as an IOSR. An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable).

The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.1-D1.1 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and appropriate electrical power provided.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. FUNCTION ID NUMBER: 4.2.1.1-D1.2

II. FUNCTION TITLE: Provide back-up power for waste storage in DST farms

III. FUNCTION DEFINITION:

Provide back-up power to loads supporting waste storage in DST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing or as long as the loads are identified as requiring back-up power.

IV. INTERFACES

A. INPUTS

4.2.1.1-D1.2 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.1-D1.2 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.1-D1.2 O1 Generated Power To: 4.2.1.1-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.1-D1.2 O2 Alternate Power To: 4.2.1.1-D1.3
4.2.1.1-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. FUNCTION REQUIREMENTS

See Table D2-2

VI. INTERFACE REQUIREMENTS

See Table D2-2

4.2.1.1-D1.2 I2 Safety Class Power

4.2.1.1-D1.2 I2 Issue 1

The latest revisions of the Interim Safety Equipment Lists Double-Shell Tanks, and Aging Waste Facilities state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Double Shell Tank Farms include the primary tank instrumentation system (temperature, liquid-level, and pressure/vacuum monitoring). Items designated as IOSR for the Aging Waste Facilities include the primary tank instrumentation system, as well as the air-lift circulators. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads.

The present electrical system is designated as an IOSR. These documents designate the ventilation system, its instrumentation system, and the secondary tank instrumentation (annulus leak detection) as safety class 2 equipment for the Double Shell Tank Farms; the primary and backup ventilation system, primary tank leak detection system, compressed air system, pressure/vacuum measuring system, emergency cooling water system and the steam supply systems as safety class 2 for the Aging Waste Facilities. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable).

The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.1-D1.2 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and appropriate electrical power provided.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.1-D1.3

II. **FUNCTION TITLE:** Distribute power to SST farms for waste storage

III. **FUNCTION DEFINITION:**

Distribute electrical power from the existing utility distribution system to the equipment located in and associated with the SST farms in order to support waste storage. This includes equipment that supports the monitoring and confinement of the stored wastes.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.1-D1.3 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.1-D1.3 I2 Generated Power From: 4.2.1.1-D1
4.2.1.1-D1.1

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.1-D1.3 I3 Alternate Power From: 4.2.1.1-D1.1

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.1-D1.3 O1 Electrical Power To: 4.2.1.1

Electrical power taken from the utility system and distributed to the respective tank farms loads.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.1-D1.4

II. **FUNCTION TITLE:** Distribute power to DST farms for waste storage

III. **FUNCTION DEFINITION:**

Distribute electrical power from the existing utility distribution system to the equipment located in and associated with the DST farms in order to support waste storage. This includes equipment that supports the monitoring and confinement of the stored wastes.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.1-D1.4 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.1-D1.4 I2 Generated Power From: 4.2.1.1-D1
4.2.1.1-D1.2

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.1-D1.4 I3 Alternate Power From: 4.2.1.1-D1.2

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.1-D1.4 O1 Electrical Power To: 4.2.1.1

Electrical power taken from the utility system and distributed to the respective tank farm loads.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.3-D1

II. **FUNCTION TITLE:** Provide Electrical Power to Tank Farms for Waste Retrieval

III. **FUNCTION DEFINITION:** .

Provide power from the existing utility distribution system to the tank farms to support the current and future retrieval activities. This includes providing back-up power (where applicable) and distributing power to DST farms and SST farms. Loads would include equipment that supports the retrieval of the tank wastes and electrical system capacity would be available for future retrieval loads.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

Enabling Assumptions

1. Electrical power is needed to support the removal of waste from the tanks.
2. The electrical system must have the capacity to support future retrieval efforts.
3. Loads (equipment) to retrieve wastes will be provided by other projects.
4. Upgrading the existing electrical system to handle future loads is within the scope of this project.
5. Safety Class loads will be identified through safety analysis.

IV. **INTERFACES**

A. INPUTS

4.2.1.3-D1 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.3-D1 I2 Load Data From: EXT

Information on the existing and future tank farm equipment with respect to power requirements (motor sizes, voltage requirements, etc.)

B. OUTPUTS

4.2.1.3-D1 O1 Alternate Power To: 4.2.1.3-D1.3
4.2.1.3-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

4.2.1.3-D1 02 Generated Power From: 4.2.1.3-D1.3
4.2.1.3-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the loads identified as requiring back-up power.

4.2.1.3-D1 03 Electrical Power To: 4.2.1.3

Electrical power taken from the utility system and distributed to the respective tank farm loads.

4.2.1.3-D1 04 Excess Equipment To: 4.2.3.4

Obsolete equipment that has been removed or replaced by the upgraded electrical system.

4.2.1.3-D1 05 Reusable Materials To: 4.2.3.6

Materials and equipment no longer required by the electrical upgrades project but suitable for reuse by TWRS or other programs.

V. FUNCTION REQUIREMENTS

See Table D2-2

VI. INTERFACE REQUIREMENTS

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.3-D1.1

II. **FUNCTION TITLE:** Provide back-up power for waste retrieval in SST farms

III. **FUNCTION DEFINITION:**

Provide back-up power to waste retrieval loads in SST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.3-D1.1 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.3-D1.1 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.3-D1.1 O1 Generated Power To: 4.2.1.3-D1.3

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.3-D1.1 O2 Alternate Power To: 4.2.1.3-D1.3

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

4.2.1.3-D1.1 I2 Safety Class Power

4.2.1.3-D1.1 I2 Issue 1

The latest revision of the Interim Safety Equipment List (SEL) for the Single Shell Tanks state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Single Shell Tank Farms include tank temperature instrumentation and tank liquid-level instrumentation. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads.

For the Single Shell Tanks, the document designates the active ventilation exhaust radiation monitoring system as safety class 2. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

The present electrical system is designated as an IOSR. An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable).

The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.3-D1.1 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and the electrical power systems designed appropriately.

Safety classification of new tank farm equipment must be determined though safety analysis for the same reasons listed above.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.3-D1.2

II. **FUNCTION TITLE:** Provide back-up power for waste retrieval the DST farms

III. **FUNCTION DEFINITION:**

Provide back-up power to waste retrieval loads in DST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.3-D1.2 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.3-D1.2 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.3-D1.2 O1 Generated Power To: 4.2.1.3-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.3-D1.2 O2 Alternate Power To: 4.2.1.3-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

4.2.1.3-D1.2 I2 Safety Class Power

4.2.1.3-D1.2 I2 Issue 1

The latest revisions of the Interim Safety Equipment Lists Double-Shell Tanks, and Aging Waste Facilities state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Double Shell Tank Farms include the primary tank instrumentation system (temperature, liquid-level, and pressure/vacuum monitoring). Items designated as IOSR for the Aging Waste Facilities include the primary tank instrumentation system, as well as the air-lift circulators. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads.

These documents designate the ventilation system, its instrumentation system, and the secondary tank instrumentation (annulus leak detection) as safety class 2 equipment for the Double Shell Tank Farms; the primary and backup ventilation system, primary tank leak detection system, compressed air system, pressure/vacuum measuring system, emergency cooling water system and the steam supply systems as safety class 2 for the Aging Waste Facilities. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

The present electrical system is designated as an IOSR. An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable). The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.3-D1.2 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and appropriate electrical power provided.

Safety classification of new tank farm equipment must be determined though safety analysis for the same reasons listed above.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.3-D1.3

II. **FUNCTION TITLE:** Distribute power to SST farms for waste retrieval

III. **FUNCTION DEFINITION:**

Distribute electrical power from the existing utility distribution system to the retrieval equipment located in and associated with the SST farms.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.3-D1.3 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.3-D1.3 I2 Generated Power From: 4.2.1.3-D1
4.2.1.3-D1.1

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.3-D1.3 I3 Alternate Power From: 4.2.1.3-D1.1

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.3-D1.3 O1 Electrical Power To: 4.2.1.3

Electrical power taken from the utility system and distributed to the respective tank farms loads.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.3-D1.4

II. **FUNCTION TITLE:** Distribute power to DST farms for waste retrieval

III. **FUNCTION DEFINITION:**

Distribute electrical power from the existing utility distribution system to the retrieval equipment located in and associated with the DST farms.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.3-D1.4 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.3-D1.4 I2 Generated Power From: 4.2.1.3-D1
4.2.1.3-D1.2

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.3-D1.4 I3 Alternate Power From: 4.2.1.3-D1.2

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.1-D1.4 O1 Electrical Power

Electrical power taken from the utility system and distributed to the respective tank farms loads.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.4-D1

II. **FUNCTION TITLE:** Provide Electrical Power to Tank Farms for Waste Transfer

III. **FUNCTION DEFINITION:**

Provide power from the existing utility distribution system to the tank farms to support the waste transfer activities. This includes providing back-up power (where applicable) and distributing power to DST farms and SST farms for existing and future loads. Loads would include equipment that supports transfer of the wastes between tanks or processing facilities.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

Enabling Assumptions

1. Electrical power is required is required for the waste transfer upgrades.
2. Waste transfer equipment that are located in the farms and require electrical power are within the scope of this project.
3. Upgrading the existing electrical system to handle future waste transfer loads is within the scope of this project.
4. Safety Class loads will be identified through safety analysis.
5. Loads (equipment) to transfer waste will be provided by other projects.

IV. **INTERFACES**

A. INPUTS

4.2.1.4-D1 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.4-D1 I2 Load Data From: EXT

Information on the existing and future tank farm equipment with respect to power requirements (motor sizes, voltage requirements, etc.)

B. OUTPUTS

4.2.1.4-D1 O1 Alternate Power To: 4.2.1.4-D1.3
4.2.1.4-D1.4

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

4.2.1.4-D1 02 Generated Power From: 4.2.1.4-D1.3
4.2.1.4-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the loads identified as requiring back-up power.

4.2.1.4-D1 03 Electrical Power To: 4.2.1.4

Electrical power taken from the utility system and distributed to the respective tank farm loads.

4.2.1.4-D1 04 Excess Equipment To: 4.2.3.4

Obsolete equipment that has been removed or replaced by the upgraded electrical system.

4.2.1.1-D1 05 Reusable Materials To: 4.2.3.6

Materials and equipment no longer required by the electrical upgrades project but suitable for reuse by TWRS or other programs.

V. FUNCTION REQUIREMENTS

See Table D2-2

VI. INTERFACE REQUIREMENTS

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.4-D1.1

II. **FUNCTION TITLE:** Provide back-up power in the SST farms for waste transfer

III. **FUNCTION DEFINITION:**

Provide back-up power to waste transfer loads in SST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.4-D1.1 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.4-D1.1 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.4-D1.1 O1 Generate Power To: 4.2.1.4-D1.3

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.4-D1.1 O2 Alternate Power To: 4.2.1.4-D1.3

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

4.2.1.4-D1.1 I2 Safety Class Power

4.2.1.4-D1.1 I2 Issue 1

The latest revision of the Interim Safety Equipment List for the Single Shell Tanks state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Single Shell Tank Farms include tank temperature instrumentation and tank liquid-level instrumentation. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads. For the Single Shell Tanks, the document designates the active ventilation exhaust radiation monitoring system as safety class 2. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

The present electrical system is designated as an IOSR. An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable).

The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.4-D1.1 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and appropriate electrical power provided.

Safety classification of new tank farm equipment must be determined though safety analysis for the same reasons listed above.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.4-D1.2

II. **FUNCTION TITLE:** Provide back-up power in the DST farms for waste transfer

III. **FUNCTION DEFINITION:**

Provide back-up power to waste transfer loads in DST farms that require back-up power. This will allow for continued operations of the equipment when normal power is not available.

Back-up power capabilities to be provided during interim storage of wastes in the tanks until all the wastes is removed from the tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.4-D1.2 I1 Raw Materials From: EXT

Raw materials (fuel, etc.) required to generate electrical power.

4.2.1.4-D1.2 I2 Safety Class Load Data From:EXT

Information regarding the safety classification of tank farm equipment.

B. OUTPUTS

4.2.1.4-D1.2 O1 Generate Power To: 4.2.1.4-D1.4

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.4-D1.2 O2 Alternate Power To: 4.2.1.4-D1.3

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

4.2.1.4-D1.2 I2 Safety Class Power

4.2.1.4-D1.2 I2 Issue 1

The latest revisions of the Interim Safety Equipment Lists Double-Shell Tanks, and Aging Waste Facilities state that the AC power distribution system for these facilities is classified as an Interim Operational Safety Requirement (IOSR). Other items designated as IOSR for the Double Shell Tank Farms include the primary tank instrumentation system (temperature, liquid-level, and pressure/vacuum monitoring). Items designated as IOSR for the Aging Waste Facilities include the primary tank instrumentation system, as well as the air-lift circulators. Safety classifications of these items must be designated in order to determine the type of power to be supplied to these loads.

These documents designate the ventilation system, its instrumentation system, and the secondary tank instrumentation (annulus leak detection) as safety class 2 equipment for the Double Shell Tank Farms; the primary and backup ventilation system, primary tank leak detection system, compressed air system, pressure/vacuum measuring system, emergency cooling water system and the steam supply systems as safety class 2 for the Aging Waste Facilities. Backup electrical power must be provided to these loads per WHC-SD-GN-DGS-303.

The present electrical system is designated as an IOSR. An IOSR is designated to those systems, components, and structures important to health, safety, and environmental protection, but, for which current analyses are not sufficient to establish safety classification. Such items shall be treated as safety class 3, with the additional designation as Operational Safety Requirements (OSR) related. The additional OSR designation will ensure the priority and funding for continued operation and maintenance of these items, consistent with OSR requirements (IOSR where applicable). The IOSR safety classifications will be replaced to be consistent with the requirements of MRP 5.46, as analyses are completed to establish definite safety classifications.

4.2.1.4-D1.2 I2 Issue 1 Required Analysis 1

Complete the analyses of the tank farm equipment and designate safety classification. Electrical system safety classification can then be determined and appropriate electrical power provided.

Safety classification of new tank farm equipment must be determined though safety analysis for the same reasons listed above.

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. FUNCTION ID NUMBER: 4.2.1.4-D1.3

II. FUNCTION TITLE: Distribute power to SST farms for waste transfer

III. FUNCTION DEFINITION:

Distribute electrical power from the existing utility distribution system to the waste transfer equipment located in and associated with the SST farms.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. INTERFACES

A. INPUTS

4.2.1.4-D1.3 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.4-D1.3 I2 Generated Power From: 4.2.1.4-D1
4.2.1.4-D1.1

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the SST farm distribution system to loads identified as requiring back-up power.

4.2.1.4-D1.3 I3 Alternate Power From: 4.2.1.4-D1.1

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.4-D1.3 O1 Electrical Power To: 4.2.1.4

Electrical power taken from the utility system and distributed to the respective tank farms loads.

V. FUNCTION REQUIREMENTS

See Table D2-2

VI. INTERFACE REQUIREMENTS

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

I. **FUNCTION ID NUMBER:** 4.2.1.4-D1.4

II. **FUNCTION TITLE:** Distribute power to DST farms for waste transfer

III. **FUNCTION DEFINITION:**

Distribute electrical power from the existing utility distribution system to the waste transfer equipment located in and associated with the DST farms.

Electrical power will be provided during interim storage until all the waste is removed from these tanks for final processing.

IV. **INTERFACES**

A. INPUTS

4.2.1.4-D1.4 I1 Utility Power From: EXT

Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration.

4.2.1.4-D1.4 I2 Generated Power From: 4.2.1.4-D1
4.2.1.4-D1.2

Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the DST farm distribution system to loads identified as requiring back-up power.

4.2.1.4-D1.4 I3 Alternate Power From: 4.2.1.4-D1.2

A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.

B. OUTPUTS

4.2.1.4-D1.4 O1 Electrical Power

Electrical power taken from the utility system and distributed to the respective tank farms loads.

V. **FUNCTION REQUIREMENTS**

See Table D2-2

VI. **INTERFACE REQUIREMENTS**

See Table D2-2

VII. EXPECTED SYSTEM PERFORMANCE

As the project evolves and continues into detailed design, the electrical system's expected performance can be determined with the clearer understanding of the loads it is anticipated to supply. WHC-SD-WM-SEL-020, WHC-SD-WM-SEL-026, WHC-SD-WM-SEL-027, WHC-SD-HS-SAR-010, and WHC-SD-WM-SAR-016 provide information on the safety classification and power requirements for the existing tank farm loads.

2.3 INTERFACE IDENTIFICATION

Table D2-1 below lists the functional interfaces of the the tank farms electrical upgrades portion of Project W-314. Interfaces are inputs and outputs of functions. An input is defined as anything that is acted upon by a function to produce desired outputs; an output is anything that leaves a function after it has been acted on by that function. The inputs and outputs of each function are also listed in the Function Description Sheets in section 2.2.

Interfaces with other upgrades provided by Project W-314 will be identified and shown in this table when all the Appendices for this F&R Document are complete.

TABLE D2-1 ELECTRICAL SYSTEM UPGRADES INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Utility Power Electrical power provided from the utility power grid located in the 200 Areas. The utility power grid in turn receives its power from the Bonneville Power Administration (BPA).	External	4.2.1.1-D1 4.2.1.1-D1.3 4.2.1.1-D1.4 4.2.1.3-D1 4.2.1.3-D1.3 4.2.1.3-D1.4 4.2.1.4-D1 4.2.1.4-D1.3 4.2.1.4-D1.4
Raw Materials Raw materials (fuel, etc.) required to generate electrical power.	External	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2
Alternate Power A separate connection to the utility distribution grid which can be used in lieu of the normal source of power from the utility distribution grid.	4.2.1.1-D1 4.2.1.1-D1.1 4.2.1.1-D1.2	4.2.1.1-D1.3 4.2.1.1-D1.4
	4.2.1.3-D1 4.2.1.3-D1.1 4.2.1.3-D1.2	4.2.1.3-D1.3 4.2.1.3-D1.4
	4.2.1.4-D1 4.2.1.4-D1.1 4.2.1.4-D1.2	4.2.1.4-D1.3 4.2.1.4-D1.4
Load Data Information on the existing and future tank farm equipment with respect to power requirements (motor sizes, voltage requirements, etc.)	External	4.2.1.1-D1 4.2.1.3-D1 4.2.1.4-D1

TABLE D2-1 ELECTRICAL SYSTEM UPGRADES INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Generated Power Back-up power generated from onsite sources independent from BPA and the utility power grid, but tied into the tank farms electrical distribution system. Back-up power will be provided to the loads identified as requiring back-up power.	4.2.1.1-D1 4.2.1.1-D1.1 4.2.1.1-D1.2	4.2.1.1-D1.3 4.2.1.1-D1.4
	4.2.1.3-D1 4.2.1.3-D1.1 4.2.1.3-D1.2	4.2.1.3-D1.3 4.2.1.3-D1.4
	4.2.1.4-D1 4.2.1.4-D1.1 4.2.1.4-D1.2	4.2.1.4-D1.3 4.2.1.4-D1.4
Electrical Power Electrical power taken from the utility system and distributed to the respective tank farms loads.	4.2.1.1-D1 4.2.1.1-D1.3 4.2.1.1-D1.4	4.2.1.1
	4.2.1.3-D1 4.2.1.3-D1.3 4.2.1.3-D1.4	4.2.1.3
	4.2.1.4-D1 4.2.1.4-D1.3 4.2.1.4-D1.4	4.2.1.4
Safety Class Load Data Information regarding the safety classification of tank farm equipment.	External	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2
Excess Equipment Obsolete equipment that has been removed or replaced by the upgraded electrical system.	4.2.1.1-D1 4.2.1.3-D1 4.2.1.4-D1	4.2.3.5
Reusable Materials Materials and equipment no longer required by the electrical upgrades project but suitable for reuse by TWRS or other programs.	4.2.1.1-D1 4.2.1.3-D1 4.2.1.4-D1	4.2.3.6

2.4 FUNCTIONAL AND INTERFACE REQUIREMENTS LIST ALLOCATION

Table D2-2 lists the constraints identified for the Tank Farms Electrical Upgrades portion of Project W-314. These constraints are allocated to the Electrical Upgrades functions and interfaces which are defined in the Function Description Sheets. Constraints are requirements imposed by sources external to the TWRS program (e.g., Congress, Ecology, DOE Orders), and are identified as C1, C2, etc.

TWRS 4.2.X.X - Fourth-Level function to which the requirement is allocated, per DOE /RL-92-60

S/RID - Tank Farms Standards/Requirements Identifications Document, High Level Waste Storage Tank Farms

TABLE D2-2 ELECTRICAL SYSTEM UPGRADES REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
ANSI C2, National Electrical Safety Code		Utility Power	DOE 6430.1A, General Design Criteria
NFPA 70, National Electrical Code	4.2.1.1-D1 4.2.1.1-D1.3 4.2.1.1-D1.4 4.2.1.3-D1 4.2.1.3-D1.3 4.2.1.3-D1.4 4.2.1.4-D1 4.2.1.4-D1.3 4.2.1.4-D1.4	Electrical Power	DOE 6430.1A, General Design Criteria
DOE 5820.2A, Radioactive Waste Management, "Each facility shall utilize remote maintenance features and other appropriate techniques to minimize personnel radiation exposure in accordance with DOE 5481.1B."	4.2.1.1-D1 4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.1-D1.3 4.2.1.1-D1.4 4.2.1.3-D1 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.3-D1.3 4.2.1.3-D1.4 4.2.1.4-D1 4.2.1.4-D1.1 4.2.1.4-D1.2 4.2.1.4-D1.3 4.2.1.4-D1.4		S/RID - Functional Area: Environmental Restoration and Waste Management

TABLE D2-2 ELECTRICAL SYSTEM UPGRADES REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
WHC-SD-GN-DGS-303, Backup Electrical Power System Definitions and Design Criteria	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2	Generated Power	WHC-CM-1-3, Management Requirements and Procedures, MRP 5.46, Safety Classification of Systems, Components and Structures
DOE 5820.2A, Radioactive Waste Management. "Electrical monitoring and leak detection devices essential to safe operations shall be provided with backup power, as appropriate, to ensure operability under emergency conditions."	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2	Generated Power	S/RID - Functional Area: Environmental Restoration and Waste Management
WHC-SD-GN-DGS-303, Backup Electrical Power System Definitions and Design Criteria	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2	Generated Power Alternate Power	DOE 6430.1A, General Design Criteria
DOE 5820.2A, Radioactive Waste Management	4.2.1.1-D1.1 4.2.1.1-D1.2 4.2.1.3-D1.1 4.2.1.3-D1.2 4.2.1.4-D1.1 4.2.1.4-D1.2		TWRS 4.2.1.1
DOE 5820.2A, Radioactive Waste Management, Chapter V		Excess Equipment	TWRS 4.2
DOE 5820.2A, Radioactive Waste Management, Chapter V		Reusable Materials	TWRS 4.2

TABLE D2-2 ELECTRICAL SYSTEM UPGRADES REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS	INTERFACES	SOURCE
RLIP 5480.11, Radiation Protection for Occupational Workers		Reusable Materials	TWRS 4.2
WHC-CM-1-3, Management Requirements and Procedures, MRP 5.46, Safety Classification of Systems, Components and Structures		Safety Class Load Data	Safety Equipment Lists, Safety Analysis Reports, Hazards Analysis Reports

REFERENCES

REGULATIONS, ORDERS, CODES, AND STANDARDS

Ecology, EPA, and DOE, 1992, *Hanford Federal Facility Agreement and Consent Order*, 2 volumes, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and Richland Operations Office, Richland, Washington (Tri-Party Agreement).

DOE, 1988, *Radioactive Waste Management*, DOE Order 5820.2A, U.S. Department of Energy, Washington, D.C.

DOE, 1989, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

NFPA, 1993, *National Electrical Code*, NFPA 70-1990, National Fire Protection Association, Quincy, Massachusetts.

ANSI, 1993, *National Electrical Safety Code*, ANSI C2 Handbook, American National Standards Institute, New York, New York.

SUPPORTING INFORMATION

WHC-SD-WM-ISB-001, Rev.0, Hanford Site Tank Farm Facilities Interim Safety Basis

WHC-SD-WM-OSR-004, Rev.1, Double Shell Tank Interim Operational Safety Requirements

WHC-SD-WM-OSR-005, Rev.0, Single Shell Tank Interim Operational Safety Requirements

WHC-SD-WM-OSR-016, Rev.0, Aging Waste Facilities Interim Operational Safety Requirements

WHC-SD-WM-SEL-026, Rev.1, Double Shell Tanks Interim Safety Equipment List

WHC-SD-WM-SEL-027, Rev.1, Single Shell Tank Farms Interim Safety Equipment List

WHC-SD-WM-SEL-020, Rev.2, Aging Waste Facility Interim Safety Equipment List

WHC-SD-GN-DGS-303, Backup Electrical Power System Definitions and Design Criteria

WHC-CM-1-6, WHC Radiological Control Manual

WHC-SD-WM-SAR-016, Rev.1, Double Shell Tank Farm Facility Safety Analysis

Report

WHC-SD-WM-SAR-010, Rev.1, Aging Waste Facility Safety Analysis Report