

**DOE/ID-10825
Revision 0**

**Preliminary Design Report for the Staging, Storage,
Sizing, and Treatment Facility (30% Design)**

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U.S. Department of Energy
Idaho Operations Office**

ABSTRACT

The Idaho National Engineering and Environmental Laboratory (INEEL), including the Idaho Nuclear Technology and Engineering Center (INTEC), was placed on the National Priorities List (NPL) in November 1989. A Federal Facility Agreement and Consent Order (FFA/CO) ¹ was negotiated with the Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare (IDHW) to direct the cleanup activities at the INEEL. A comprehensive study, or Remedial Investigation/Baseline Risk Assessment (RI/BRA) ², was conducted to evaluate the nature and extent of soil and groundwater contamination at the INTEC. The results of the RI/BRA activities indicate that soil at certain release sites and groundwater contamination pose a potential risk above acceptable levels to human health and the environment. Therefore, the U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the INTEC in accordance with the Waste Area Group (WAG) 3, Operable Unit 3-13 Record of Decision (ROD) ³. The ROD requires contaminated surface soils to be removed and disposed on-Site in the INEEL Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Disposal Facility (ICDF). The ICDF will be an engineered facility meeting DOE Order 435.1 ⁴, Resource Conservation and Recovery Act (RCRA) ⁵ Subtitle C, and Toxic Substance Control Act (TSCA) ⁶ polychlorinated biphenyl (PCB) landfill design and construction requirements. A support facility, the Staging, Storage, Sizing and Treatment Facility (SSSTF), will be constructed adjacent to the ICDF.

This Preliminary Design for the SSSTF provides waste treatment and interface support capabilities for the ICDF. The SSSTF will provide the capabilities to receive waste from INEEL WAG 3 and other INEEL WAGs and direct the waste to disposal in the ICDF, to segregation and treatment processes within the SSSTF and subsequent ICDF disposal, or to off-Site disposal. The SSSTF will serve as the waste acceptance and inventory control portal for the ICDF and off-Site disposal. The SSSTF will also provide the capability to receive and store well development and purge water generated as a result of INEEL CERCLA remedial actions. Infrastructure supporting staging of waste in preparation for treatment, waste size reduction and blending, equipment decontamination, and internal facility waste transportation are also included in this concept. The configuration and overall design will plan for future expansion capabilities and enhance the overall operations of the disposal activities of the ICDF as conditions permit.

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ACRONYMS

ACGIH	American Conference of Governmental Hygienists
ADA	Americans with Disabilities Act
AEA	Atomic Energy Act
ALARA	As Low As Reasonably Achievable
AOC	Area of Contamination
ARAR	Applicable or Relevant and Appropriate Requirement
BBWI	Bechtel BWXT Idaho, LLC
CAM	Continuous Air Monitor
CDR	Conceptual Design Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFS	Chemical Fixation and Stabilization
CWID	CERCLA Waste Inventory Database
D&D&D	Deactivation, Decontamination, and Dismantlement
DACR	Digital Alarm Communication Receiver
DACT	Digital Alarm Communication Transmitter
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	Engineering Design File
ENS	Emergency Notification System
EP	evaporation pond
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facilities Agreement and Consent Order
GSA	General Services Administration
HEPA	High-Efficiency Particulate Air

HVAC	Heating, Ventilation, and Air Conditioning
HW	Hazardous Waste
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IDW	investigative derived waste
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LAN	Local Area Network
LDR	Land Disposal Restriction
LLW	low-level waste
MLLW	mixed low-level waste
NESHAP	National Emission Standard for Hazardous Air Pollutants
NPL	National Priorities List
O&M	Operations and Maintenance
OSHA	Occupational Health and Safety Administration
OU	Operable Unit
PC	Performance Category
PC	Portland Cement
PCB	Polychlorinated Biphenyl
PCM	Personnel Contamination Monitor
PPE	Personal Protective Equipment
PM	Project Management
ppm	Parts per Million
RAL	Remote Analytical Laboratory

RBA	radiological buffer area
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RFP	Request for Proposal
RI	Remedial Investigation
RI/BRA	Remedial Investigation/Baseline Risk Assessment
ROD	Record of Decision
SSA	Staging and Storage Annex
SSSTF	Staging, Storage, Sizing, and Treatment Facility
T&FR	Technical and Functional Requirements
TBC	To Be Considered
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure
TRU	Transuranic
TSCA	Toxic Substance Control Act
UBC	Uniform Building Code
USGS	United States Geological Survey
UTS	Universal Treatment Standard
UV	Ultraviolet
WAC	Waste Acceptance Criteria
WAG	Waste Area Group
WCC	Warning Communications Center
WP	Work Plan

Preliminary Design Report for the Staging, Storage, Sizing, and Treatment Facility (Draft)

1. INTRODUCTION

1.1 Background

The U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (see Reference 3).

The ROD requires Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation wastes generated within the Idaho National Engineering and Environmental Laboratory (INEEL) boundaries to be removed and disposed on-Site in the INEEL CERCLA Disposal Facility (ICDF). The ICDF, which will be located south of INTEC and adjacent to the existing percolation ponds, will be an on-Site, engineered facility, meeting DOE Order 435.1 (see Reference 4), Resource Conservation and Recovery Act (RCRA) Subtitle C (see Reference 5), and Toxic Substance Control Act (TSCA) (see Reference 6) polychlorinated biphenyl (PCB) landfill design and construction requirements. The ICDF will include the necessary subsystems and support facilities to provide a complete waste disposal system.

The major components of the ICDF are the disposal cells; an evaporation pond; and the Staging, Storage, Sizing, and Treatment Facility (SSSTF). The disposal cells, including a buffer zone, will cover approximately 40 acres, with a disposal capacity of approximately 510,000 yd³. Current projections of INEEL-wide CERCLA waste volumes total approximately 483,800 yd³. The SSSTF will be designed to provide centralized receiving, inspection, and treatment necessary to stage, store, and treat incoming waste from various INEEL CERCLA remediation sites prior to disposal in the ICDF or shipment off-Site. All SSSTF activities shall take place within the WAG 3 area of contamination (AOC) to allow flexibility in managing the consolidation and remediation of wastes without triggering Land Disposal Restrictions (LDRs) and other RCRA requirements, in accordance with the OU 3-13 ROD (see Reference 3). Only low-level, mixed low-level, hazardous, and limited quantities of TSCA wastes will be treated and/or disposed at the ICDF. Most of the waste will be contaminated soil, but debris and Investigation-Derived Waste (IDW) will also be included in the waste inventory. ICDF leachate, decontamination water, and water from CERCLA well purging, sampling, and well development activities will also be disposed in the ICDF evaporation pond.

Only INEEL on-Site CERCLA wastes meeting the agency-approved Waste Acceptance Criteria (WAC) will be accepted at the ICDF. An important objective of the WAC will be to ensure that hazardous substances disposed in the ICDF will not result in exceeding groundwater quality standards in the underlying groundwater aquifer. Acceptance criteria will include restrictions on contaminant concentrations based on groundwater modeling results with the goal of preventing potential future risk to the Snake River Plain Aquifer (SRPA).

1.2 Selected Remedy

The ICDF Complex will encompass three major functions:

- The SSSTF for the processing of wastes to an acceptable form for disposal
- The ICDF Landfill for disposal of low-level non-aqueous waste
- The evaporation pond for the disposal of aqueous wastes.

The SSSTF will process remediated wastes from areas as identified in the Federal Facilities Agreement and Consent Order (FFA/CO) (see Reference 1). These areas encompass all Waste Area Groups (WAGs) at the INEEL. The wastes that will be processed through the SSSTF are identified in DOE/ID-10803, September 2000, *CERCLA Waste Inventory Database Report for the Operable Unit 3-13 Waste Disposal Complex*⁷. All wastes will be processed through the SSSTF and be dispositioned to either:

- Go directly to the landfill if ICDF Landfill Waste Acceptance Criteria (WAC) are met
- Be treated to meet the ICDF Landfill WAC and then be sent to the landfill
- Go directly to the evaporation pond (EP) if ICDF EP WAC are met
- Be repackaged and then sent to another area either on the INEEL Site or off-Site to another disposal facility, if the waste can not be treated to meet the ICDF (WAC), or
- Be returned to the waste generator if the waste does not comply with the SSSTF WAC.

1.3 Significant Unresolved Issues

The following issues need to be resolved before Title I and/or Title II design activities can be completed.

1. Hazardous Debris

The SSSTF will be required to receive, stage, store, and treat "Hazardous Debris" as part of the CERCLA cleanup activities identified in the OU 3-13 ROD (see Reference 3). Hazardous debris is defined as debris that contains a hazardous waste listed in Subpart D of 40 CFR Part 261⁸ or that exhibits a characteristic of hazardous waste identified in Subpart C of Part 261. Debris by definition does not have a specific treatment standard as provided by Subpart of 40 CFR Part 268⁹. If a specific treatment standard does exist in Subpart D of Part 268, it is not debris. Waste is generally considered debris if its particle size is greater than 60 mm (2.36 in) and if the mixture of waste is primarily debris.

Because obtaining a representative sample of debris is a major problem, the agency (EPA) established alternative treatment standards based upon the use of required technologies. The required treatment technologies fall into three generalized categories: extraction, destruction, and immobilization. Of the required technologies, immobilization (macroencapsulation and microencapsulation) is the technique that best fits into the planned operating scenario, since stabilization is the primary treatment at SSSTF. Immobilization has the added benefit that there are no associated contaminant restrictions.

Debris Inventory

A review of the candidate waste streams for treatment revealed the boxed wastes in the Staging and Storage Annex (SSA) as the primary debris-containing waste stream. The contents of the boxes located at CPP-92, CPP-98, and CPP-99 are summarized in Table 1-1. The majority of the waste from these sites was determined to be soil (621 boxes). Wood shoring, including nails and bolts, was contained in 99 boxes and concrete (including rebar, conduit, and asphalt) was contained in 69 boxes. Eight boxes contained metal piping, rebar, angle iron, I-beams, air compressors, etc. and 23 were labeled as non-compactable. The contents of five boxes were undetermined.

Sizing Requirements

The need for sizing pertains strictly to debris, since the typical INEEL soils are less than 3 inches in diameter. Considering the worst-case scenario in that all boxed debris identified in the table above failed Toxicity Characterization Leaching Procedure (TCLP) analysis, a total of 204 boxes may need to be sized, assuming that wood, metal, large pieces of concrete, and undetermined waste would require sizing prior to disposal. This number represents less than 0.5% of the overall non-aqueous waste inventory and is representative of the current inventory worst-case scenario. Macroencapsulation may preclude this requirement on a significant portion of this debris.

Further study is required before any recommendations can be submitted to the agencies. A Debris Treatment Evaluation will be developed and presented to the agencies as part of the Final Preliminary (30%) Design Report. The evaluation shall include review of the current and projected volumes of debris waste streams, sampling issues, direct disposal opportunities, sizing requirements, and preferred treatment techniques based on cost analysis.

Table 1-1. Boxed Waste Content Summary.

Release Site	CPP-92		CPP-98		CPP-99		Total Boxes
	2x4x8	4x4x8	2x4x8	4x4x8	2x4x8	4x4x8	
Soil	584	5	17		15		621
Wood (including nails, bolts, etc.)				98		1	99
Metal (piping, rebar, angle iron, conduit, I-beams, air compressors, etc.)		1		2		5	8
Concrete (including rebar, conduit, asphalt, etc.)		40				29	69
Non-concrete (soil, asphalt, concrete)		18				5	23
Undetermined				1		4	5

2. Non-Contact Handled Waste

Site CPP-36/91 represents an existing waste stream that may require special handling and packaging procedures to implement direct disposal in the ICDF Landfill because of high levels of gamma radiation emissions. The methods to be developed by the remediators and ICDF Complex operations will need to be in concert with each other or be developed as a combined body of work.

A Non-Contact Handled Waste Transport Plan will be developed as part of the RD/RA Work Plan (WP) submittal and will address special waste packaging and handling procedures to accommodate the CPP-36 remedial waste disposal in the ICDF Landfill.

3. ICDF Landfill Waste Acceptance Criteria

The waste acceptance criteria development for the landfill is not complete and could impact the acceptance and treatment requirements for the SSSTF. The criteria are not scheduled for completion until June of 2001. The criteria information could require specific design support related to the waste sizing needs that are not specifically addressed in this submittal of the design because the lack of data does not allow for any significant evaluation. The overall SSSTF design will need to be scrutinized as the landfill WAC is developed to assure the processes satisfy the operational intent of the Complex.

4. Evaporation Pond Waste Acceptance Criteria

As documented in EDF-1549, *Evaporation Pond Waste Acceptance Criteria (WAC) Basis & Aqueous Waste Management*, the design basis assumes that no aqueous waste will require treatment prior to disposal in the evaporation pond. The current design basis may change when an accurate characterization of the aqueous waste is determined. As in the case of the landfill WAC, the evaporation pond WAC could impact the overall SSSTF design.

1.4 Report Organization

1.4.1 Document Structure

This document is divided into seven major sections. These sections, outlined below, provide the information necessary to convey and justify a preliminary design concept.

1. Section 1, "Introduction", contains an overview of the SSSTF project objectives and scope of the document.
2. Section 2, "Preliminary SSSTF/ICDF Complex Operational Concept", contains a description of the operational concept for the SSSTF.
3. Section 3, "Preliminary Design Criteria", contains design criteria. Design criteria includes Technical and Functional Requirements, assumptions, and a discussion of codes and standards.
4. Section 4, "Preliminary Design and Facility Descriptions", contains a description of the preliminary design for each of the major SSSTF functions.

5. Section 5, "Remedial Design and Remedial Action Implementation Plan", contains a preliminary plan to complete the activities leading to RD/RA Work Plan completion. This plan defines the scope of the work to be accomplished, the deliverables needed to support design, and the schedule for completion of these tasks.
6. Section 6, "Cost Estimates", contains cost estimates for each of the major areas of the SSSTF.
7. Section 7, "References", contains a listing of all references contained in the document.
8. Appendix A contains detailed cost estimate data.

1.4.2 Document Content Cross Reference

The *Conceptual Design Report for the Staging, Storage, Stabilization, and Treatment Facility*¹⁰ proposed a Preliminary Design Report table of contents. During the process of compiling the preliminary design material into the report, the report structure was modified to simplify overall document readability and clarity. All information identified in the original format is contained in the final report format. Table 1-2 provides a reference to the original table of contents and the final product.

Table 1-2. Document Structure Cross Reference.

Proposed PDR CDR Document Structure	Actual PDR Document Structure
DISCLAIMER	NA (Not Required)
ABSTRACT	ABSTRACT
TABLE OF CONTENTS	TABLE OF CONTENTS
ACRONYMS	ACRONYMS
1.0 Introduction	1.0 Introduction
1.1 Background	1.1 Background
1.2 Selected Remedy	1.2 Selected Remedy
1.3 Preliminary Design Report Organization	1.4 Report Organization
2.0 Preliminary Design Criteria and Key Assumptions	3.0 Preliminary Design Criteria
2.1 Conceptual Approach to Operating the SSSTF/ICDF	2.0 Preliminary SSSTF/ICDF Complex Operational Concept
2.2 Status of Operable Unit 3-13 Record of Decision Assumptions	N/A Not Included
2.3 Design Criteria for Utilities for SSSTF/ICDF	3.1 (Preliminary Design Criteria for) General Site and Utilities
2.4 Design Criteria for ICDF Support	3.5 (Preliminary Design Criteria for) Decontamination

Table 1-2. (continued).

Proposed PDR CDR Document Structure	Actual PDR Document Structure
Facilities	Function
2.5 Design Criteria for Storage Facility	3.3 (Preliminary Design Criteria for) Staging and Storage Function
2.6 Design Criteria for Treatment Facility	3.4 (Preliminary Design Criteria for) Waste Treatment Function
2.7 Design Criteria for Administrative Facility	3.2 (Preliminary Design Criteria for) Administrative Function
3.0 Design Basis	4.0 Preliminary Design and Facility Descriptions
3.1 Utilities for SSSTF/ICDF	4.1 General Site and Utilities
3.2 ICDF Support Facilities	4.5 Decontamination Facility
3.3 Storage Facilities	4.3 Staging and Storage Facility
3.4 Treatment Facilities	4.4 Waste Treatment Facility
3.5 Administrative Facilities	4.2 Administrative Facility
4.0 Alternatives Considered	4.0 Preliminary Design and Facility Descriptions
4.1 Utilities for SSSTF/ICDF	4.1.1 (General Site and Utilities) Alternatives Examined
4.2 ICDF Support Facilities	4.5.1 (Decontamination Facility) Alternatives Examined
4.3 Storage Facility	4.3.1 (Staging and Storage Facility) Alternatives Examined
4.4 Treatment Facility	4.4.1 (Waste Treatment Facility) Alternatives Examined
4.5 Administrative Facility	4.2.1 (Administrative Facility) Alternatives Examined
5.0 Preliminary Design and Facility Descriptions	4.0 Preliminary Design and Facility Descriptions
5.1 Utilities for SSSTF/ICDF	4.1 General Site and Utilities
5.1.1 Facility and Operational Overview	2.4 (Preliminary SSSTF/ICDF Complex Operational Concept) Waste Disposition
5.1.2 Process Description	4.1.2 Selected Approach
5.1.3 Preliminary Specifications	NA See Attached Specifications
5.1.4 Drawings and Schematics	NA See Project Plans
5.1.5 Technical Factors of Importance to	4.1.2 Selected Approach

Table 1-2. (continued).

Proposed PDR CDR Document Structure	Actual PDR Document Structure
Design and Construction	
5.1.6 Major Equipment Identification	4.1.3 Major Equipment Description
5.1.7 Operations and Maintenance Provisions	5.0 Remedial Design and Remedial Action Implementation Plan
5.2 ICDF Support Facilities	4.5 Decontamination Facility
5.2.1 Facility and Operational Overview	2.4 (Preliminary SSSTF/ICDF Complex Operational Concept) Waste Disposition
5.2.2 Process Description	4.5.2 Selected Approach
5.2.3 Preliminary Specifications	NA See Attached Specifications
5.2.4 Drawings and Schematics	NA See Project Plans
5.2.5 Technical Factors of Importance to Design and Construction	4.5.2 Selected Approach
5.2.6 Major Equipment Identification	4.5.3 Major Equipment Description
5.2.7 Operations and Maintenance Provisions	5.0 Remedial Design and Remedial Action Implementation Plan
5.3 Storage Facility	4.3 Staging and Storage Facility
5.3.1 Facility and Operational Overview	2.4 (Preliminary SSSTF/ICDF Complex Operational Concept) Waste Disposition
5.3.2 Process Description	4.3.2 Selected Approach
5.3.3 Preliminary Specifications	NA See Attached Specifications
5.3.4 Drawings and Schematics	NA See Project Plans
5.3.5 Technical Factors of Importance to Design and Construction	4.3.2 Selected Approach
5.3.6 Major Equipment Identification	4.3.3 Major Equipment Description
5.3.7 Operations and Maintenance Provisions	5.0 Remedial Design and Remedial Action Implementation Plan
5.4 Treatment Facility	4.4 Waste Treatment Facility
5.4.1 Facility and Operational Overview	2.4 (Preliminary SSSTF/ICDF Complex Operational Concept) Waste Disposition
5.4.2 Process Description	4.4.2 Selected Approach

Table 1-2. (continued).

Proposed PDR CDR Document Structure	Actual PDR Document Structure
5.4.3 Preliminary Specifications	NA See Attached Specifications
5.4.4 Drawings and Schematics	NA See Project Plans
5.4.5 Technical Factors of Importance to Design and Construction	4.4.2 Selected Approach
5.4.6 Major Equipment Identification	4.4.3 Major Equipment Description
5.4.7 Operations and Maintenance Provisions	5.0 Remedial Design and Remedial Action Implementation Plan
5.5 Administrative Facility	4.2 Administrative Facility
5.5.1 Facility and Operational Overview	2.4 (Preliminary SSSTF/ICDF Complex Operational Concept) Waste Disposition
5.5.2 Process Description	4.2.2 Selected Approach
5.5.3 Preliminary Specifications	NA See Attached Specifications
5.5.4 Drawings and Schematics	NA See Project Plans
5.5.5 Technical Factors of Importance to Design and Construction	4.2.2 Selected Approach
5.5.6 Major Equipment Identification	4.2.3 Major Equipment Description
5.5.7 Operations and Maintenance Provisions	5.0 Remedial Design and Remedial Action Implementation Plan
6.0 Recommended RA Contracting Strategy	5.0 Remedial Design and Remedial Action Implementation Plan
7.0 Identification of Unresolved Data Needs	1.3 (Introduction) Significant Unresolved Issues
8.0 Identification of RA Sampling/Verification Methods	2.2 Waste Generator Responsibilities
9.0 Schedule and Acquisition Strategy	5.0 Remedial Design and Remedial Action Implementation Plan
9.1 9.1 Acquisition Strategy	5.2.1 Subcontracting Strategy
9.2 9.2 Schedule	5.2.4 RD/RA Schedule
10.0 Cost Estimates and Funding Requirements	6.0 Cost Estimates

Table 1-2. (continued).

Proposed PDR CDR Document Structure		Actual PDR Document Structure	
10.1	Utilities for SSSTF/ICDF	6.0	Cost Estimates
10.2	ICDF Support Facilities	6.0	Cost Estimates
10.3	Storage Facilities	6.0	Cost Estimates
10.4	Treatment Facilities	6.0	Cost Estimates
10.5	Administrative Facilities	6.0	Cost Estimates
11.0	References	7.0	References

1.4.3 Engineering Design File Cross Reference

As part of the preliminary design implementation plan, several decision analyses were to be completed and documented in Engineering Design Files (EDFs). During the process of completing the tasks, some of the titles were changed to be more representative of the analysis performed and/or the information contained in the EDF. Table 1-3 provides a reference to the original EDF title and the final product.

Table 1-3. Engineering Design File Cross Reference.

EDF ID.	EDF Number	EDF Title	Comment
EDF #1	EDF-1540	Waste Inventory Design Basis	
EDF #2	EDF-1541	Organic Treatment Process Selection	EDF not included in the PDR package. Analysis indicated no organic waste streams.
EDF #3	EDF-1542	Stabilization Treatment Process Selection	
EDF #4	EDF-1543	Waste Transport Study	
EDF #5	EDF-1544	Waste Verification and Treated Waste Statistical Approach	
EDF #6	EDF-1545	Waste Storage and Staging	
EDF #7	EDF-1546	Preliminary Hazard Classification Analysis	
EDF #8	EDF-1547	SSSTF/ICDF Operational Scenario and Process Flows	
EDF #9	EDF-1548	Siting Study	
EDF #10/12	EDF-1549	Evaporation Pond Waste Acceptance Criteria (WAC) Basis & Aqueous Waste Management	Content of EDF 12 was incorporated into EDF 10.
EDF #11	EDF-1551	SSSTF Waste Acceptance Criteria	
EDF #13	EDF-1552	Management and Treatment of Non-Contact Handled Waste	EDF not included in the PDR package. Content of analysis is provided in EDF-1540.