DOE/RL-99-89
Revision 1

Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action

Supplement 2: K East Basin North Load Out Pit Sludge Treatment

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

DOE/RL-99-89
Revision 1

Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action

Supplement 2: K East Basin North Load Out Pit Sludge Treatment

Date Published
June 2005

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

H. D. Gerdal 6/20/2005
Release Approval Date

Approved for Public Release;
Further Dissemination Unlimited

TRADEMARK DISCLAIMER

Printed in the United States of America

CONTENTS

FIGURES

TABLES

TERMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BACT	best available control technology
BARCT	best available radionuclide control technology
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CH	contact-handled
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
HEPA	high-efficiency particulate air
KE	105-KE Basin
KW	105-KW Basin
LDC	large diameter container
MOU	Memorandum of Understanding
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDA	nondestructive assay
NLOP	North Load Out Pit
NPL	National Priorities List
OU	Operable Unit
PCB	polychlorinated biphenyl
PNNL	Pacific Northwest National Laboratories
PUREX	plutonium-uranium extraction
RACT	reasonably available control technology
RAWP	remedial action work plan
RBDA	risk-based disposal approval
RDR	remedial design report
RH	remote-handled
ROD	Record of Decision
SARA	*Superfund Amendments and Reauthorization Act of 1986*
SNF	spent nuclear fuel
TAP	toxic air pollutant
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

TRU	Transuranic
TSCA	*Toxic Substances Control Act of 1976*
WAC	Washington Administrative Code
WDOH	Washington Department of Health
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility

DOE/RL-99-89, Rev. 1
Supplement 2, 06/2005

REMEDIAL DESIGN REPORT AND REMEDIAL ACTION WORK PLAN FOR THE K BASINS INTERIM REMEDIAL ACTION SUPPLEMENT 2: K EAST BASIN NORTH LOAD OUT PIT SLUDGE TREATMENT

1.0 INTRODUCTION

The Hanford Site is a 1,517 square kilometer (586 square mile) Federal facility located along the Columbia River in southeastern Washington State. From 1943 until 1990, the Hanford Site produced nuclear materials for the nation's defense mission. In July 1989, the Hanford Site was listed on the National Priorities List (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980*, as amended by the *Superfund Amendments and Reauthorization Act* (SARA) *of 1986*. The Hanford Site was divided up and listed as four NPL sites: the 100 Areas, the 200 Areas, the 300 Area, and the 1100 Area. The 100 K Area K Basins are part of the 100 Area NPL site. In March-April 1999, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) signed the K Basins Interim Action Record of Decision (ROD). The ROD directed removal of the spent nuclear fuel (SNF), sludge, water, and debris from the two K Basins in Hanford's 100 K Area. The ROD also directed that the basins be decontaminated to the extent necessary to make it safe to drain the water from the basins.

In June 2005, a ROD amendment (EPA 2005b) was developed in accordance with CERCLA, as amended by SARA and to the extent practicable, the "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP), 40 *Code of Federal Regulations* (CFR) 300. The ROD amendment is based on the Administrative Record for the 100-KR-2 Operable Unit (OU), U.S. Department of Energy (DOE) Hanford Site. The amended remedy changes the sludge disposition and how underwater debris is retrieved, treated, and disposed from both the 105-K East (KE) and 105-K West (KW) SNF basins.

1.1 SCOPE

The ROD was modified to add treatment and packaging of the K Basins sludge. The sludge now will be removed from K Basins, treated and packaged to meet the waste acceptance criteria of the disposal facility as contact and/or remote handled waste. The ROD amendment also requires that after treatment and temporary storage at Hanford, the treated sludge will be shipped to a national repository. A portion of the sludge, anticipated to be a small amount if any, following treatment may qualify for disposal at the Hanford Site's Environmental Restoration Disposal Facility (ERDF). If so, the treated sludge will be disposed at ERDF.

Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al 2001) Change Request M-34-04-01 states,

> "The parties agree that the Record of Decision (ROD) for the 100-K Area Spent Nuclear Fuel (SNF) Basins will be modified to include treatment of sludge for disposal off site. A more detailed description of the waste management process for the sludge will be provided in the Remedial Action Work Plan."

The ROD amendment addresses all K Basins sludge treatment. Although some sludge may be treated at K Basins or another 200 Area location, it has been determined by EPA pursuant to 40 CFR 300.440(a)(4) that KE Basin North Load Out Pit (NLOP) sludge can be sent to T Plant for treatment.

NLOP sludge managed at T Plant under this work plan will no longer be considered onsite for the purposes of CERCLA and will therefore not be exempt from environmental permits. Because NLOP sludge will be managed offsite under 40 CFR 300.440, it will not be subject to applicable or relevant and appropriate requirements (ARARs), but will instead be managed in accordance with both substantive and administrative requirements of all applicable state and federal laws and regulations, including the regulatory approvals identified in this document.

This work plan is limited in scope to the treatment and temporary storage of NLOP sludge at T Plant.

1.2 PURPOSE

The purpose of this work plan is to describe the details of the NLOP sludge treatment methodology and identify the regulatory approvals applicable to NLOP sludge treatment at T Plant pursuant to CERCLA Section 121(d)(3) as codified in 40 CFR 300.440(a)(4) as part of the 100-KR-2 Operable Unit remedial action. This work plan represents a supplement to the *Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action* (DOE/RL-99-89, Revision 1).

This supplement is limited to the activities necessary to treat KE Basin NLOP sludge at T Plant located on the Hanford Site (Figure 1), which includes temporary storage of sludge at T Plant both before and after treatment. The appropriate offsite national repository for the treated KE Basin NLOP sludge determined to be contact-handled (CH) transuranic (TRU) is the Waste Isolation Pilot Plant (WIPP).

This supplement has been prepared in support of DOE's position that EPA must approve a remedial design report (RDR) and remedial action work plan (RAWP) before NLOP sludge treatment at T Plant may commence (DOE 2005). EPA has determined that NLOP sludge treatment will be considered offsite[1] management of CERCLA waste (EPA 2005b). Therefore, NLOP sludge treatment will not be exempt from having to obtain federal and state environmental permits and approvals pursuant to administrative procedures of the issuing agencies. Specifically, NLOP sludge will be managed at T Plant pursuant to 40 CFR 300.440(a)(4), which requires offsite facilities that receive waste generated from a CERCLA action to be in compliance with both the substantive and administrative requirements of applicable state and federal laws in lieu of ARARs. Therefore, this NLOP sludge RDR/RAWP provides details of the NLOP sludge treatment methodology and identifies the necessary regulatory approvals applicable to the management of NLOP sludge at T Plant.

1.3 BACKGROUND – KE BASIN NLOP SLUDGE

The KE and KW Basins, built in the early 1950's, had been used to store N Reactor SNF underwater starting in 1975 for KE Basin, 1981 for KW Basin, and much earlier for Single Pass Reactor SNF. In 1992, the decision to deactivate the Plutonium-Uranium Extraction (PUREX) Plant left approximately 2,100 metric tons of metal from the SNF in the K Basins with no means for near-term processing. A significant fraction of the SNF in the K Basins has become degraded due to cladding breaches during reactor discharge, and corrosion has continued during underwater storage.

[1] The National Contingency Plan defines *onsite* as the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action. The EPA has determined that sludge treatment at T Plant will be considered *offsite* for purposes of implementing the K Basins sludge cleanup.

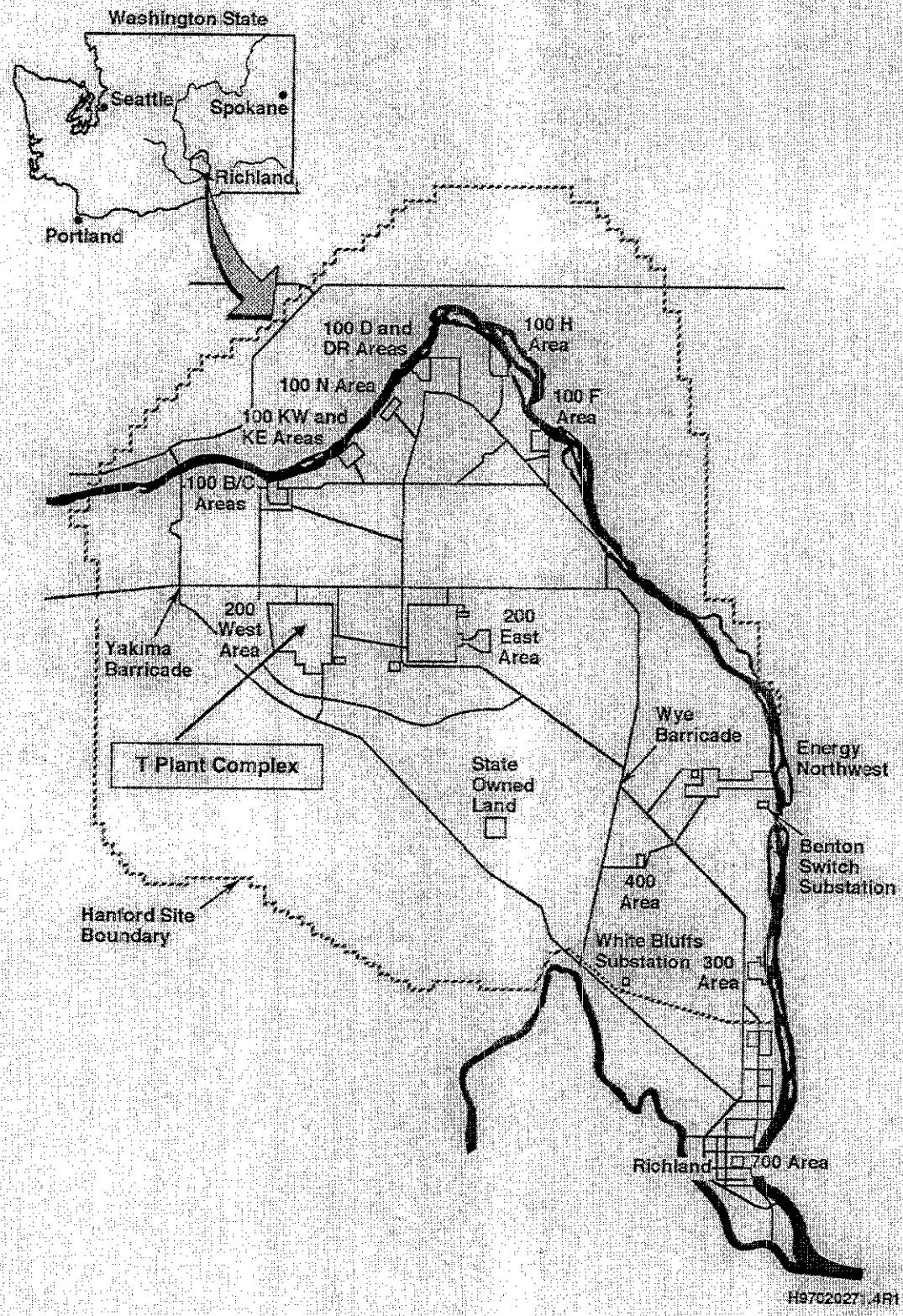

Figure 1. T Plant Complex on the Hanford Site.

The fuel in the KE Basin was stored in open-top canisters, some of which have closed bottoms while others have screened bottoms. The canisters with screened bottoms released soluble fission products into the basin water and allowed fuel corrosion products to combine with canister rack rust, concrete dust, and environmental particulate matter, which settled to the basin bottom as a fine sludge.

The KE Basin NLOP contains approximately 5 cubic meters (m^3) [177 cubic feet (ft^3)] of material (as-settled) that consists primarily of surface skimmer particulates and material from back flushing the KE Basin water treatment system sand filter, with some contamination from spent nuclear fuel corrosion products. Most of this material in addition to about 2 m^3 of sand from the associated sand filter (all of this material will be hereafter called KE Basin NLOP sludge or sludge) will be transferred as slurry from K Basin to T Plant using Large-Diameter Containers (LDC).

1.4 PROCESS DESCRIPTION

The process and its operating procedures are designed to yield a CH TRU waste form that is WIPP certifiable. The treatment system will be installed in the 221-T Building which is a Hazard Category 2 nuclear facility. The 221-T Building is made of reinforced concrete and is 260 meters (m) long, 21 m wide, and 23 m high [850 feet (ft) by 68 ft by 74 ft], and covers an area of 5,370 square meters (m^2) [57,800 square feet (ft^2)]. The building consists of the Canyon, three galleries (Operating, Pipe, and Electrical), one crane way, and a "head-end" facility. The Canyon service area consists of 37 cells, the crane way, and one tunnel entrance/exit. The tunnel used for transporting equipment and waste into and out of the canyon enters the plant at cell 2L (section 2) and will be used to transfer KE Basin NLOP sludge waste into the canyon.

The sludge/water mixture will be pumped from the LDC and transferred to the sludge grouting system where the mixture will be fed into 55-gallon (208-liter) drums, and blended with water, Portland cement and bentonite clay to create a grouted form. Efforts shall be made to minimize the number of packages produced while controlling the process at a set point below the acceptance criteria for contact-handled packages.

1.5 CERTIFIABILITY

Treated and packaged KE Basin NLOP sludge is considered certifiable for disposal at WIPP when there is confirmation that the KE Basin NLOP sludge has been treated and packaged in a system that was designed and operated to yield a CH-TRU waste form (PNNL 2004) for meeting the *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063). The requirements for WIPP certification are incorporated into HNF-EP-0063. The treatment process for the KE Basin NLOP sludge at T Plant is designed to meet the aforementioned criterion. Details associated with the treatment process are provided in Section 2.0.

1.6 POST SLUDGE TREATMENT AND PACKAGING ACTIVITIES

Following the treatment and packaging of the sludge, acceptable knowledge data packages will be prepared. Sample testing of the grouted waste form will be performed to develop nondestructive analysis (NDA) models for this waste form, to be used for assaying these waste drums at the Hanford Site's Waste Receiving and Processing Facility (WRAP).

At WRAP, these drums will be screened using the established NDA methodology. Drums found to be TRU waste will be sent to WIPP. Drums found not to TRU waste and that are low-level wastes may

qualify for onsite disposal at Environmental Restoration Disposal Facility (ERDF). All other wastes will be dispositioned at the Hanford Site in accordance with all applicable laws and regulations.

2.0 REMEDIAL DESIGN

This section describes the sludge treatment and packaging system functions; process requirements; operation effectiveness; and preferred technology and justification.

2.1 SLUDGE TREATMENT AND PACKAGING SYSTEM FUNCTIONS

The overall system function for the KE Basin NLOP sludge grouting process is to treat and package the sludge into a form that is certifiable for disposal at WIPP.

The basic unit operations associated with the KE Basin NLOP sludge grouting process at T Plant (Figure 2) are listed as follows:

- Prepare blend additives in drums
- Receive LDC cask containing sludge from KE Basin
- Stage the LDC at the treatment location
- Prepare the LDC for sludge transfer
- Transfer sludge from LDC to grouting system
- Determine volume of sludge to be loaded in drums
- Prepare and stage the drum
- Load sludge and blend additives into drum
- Staging of drums
- Storage of drums.

Treatment, packaging and storage locations and components would be marked, as appropriate, as containing polychlorinated biphenyl (PCB) remediation waste, in accordance with the *Toxic Substances Control Act* (TSCA) *of 1976*.

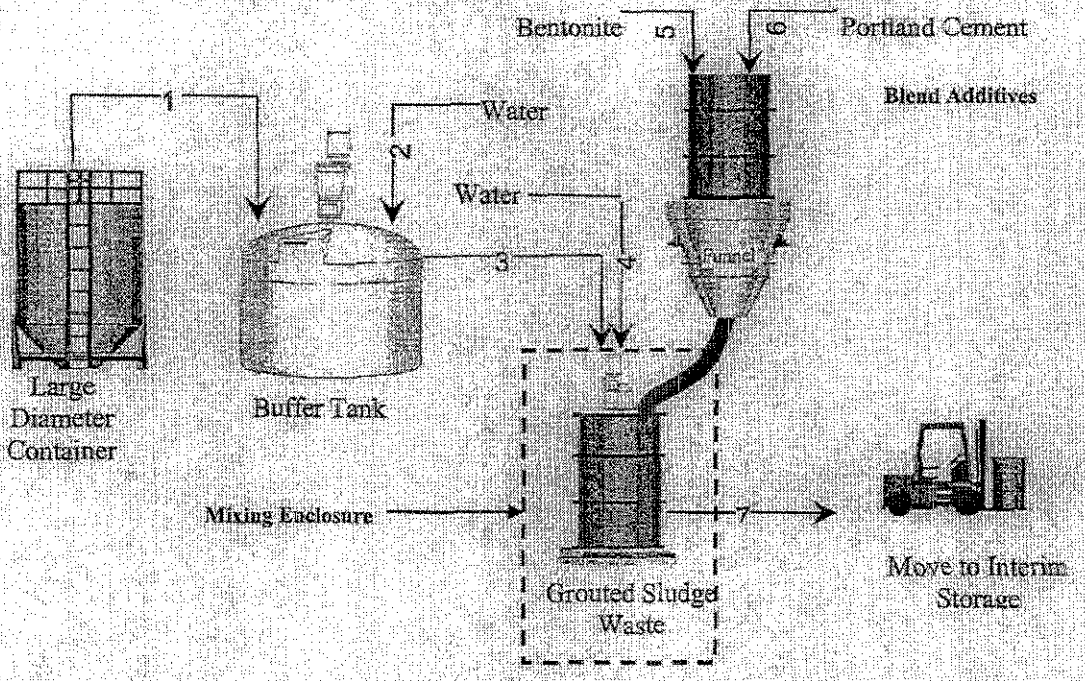

Figure 2. General KE Basin NLOP Sludge Grouting Process Overview.

2.1.1 Prepare Blend Additives in Drums

Portland cement and bentonite clay powders are pre-weighed (at a location away from the treatment location) and added to pre-staged drums. The lids and tamper-proof seals are then applied. A pre-determined number of drums with lids attached are moved to the treatment location.

2.1.2 Receive LDC Cask Containing Sludge from KE Basin

The KE Basin NLOP sludge arrives at T Plant from the K Basins via the transport vehicle (truck and trailer). Each shipment consists of one transport cask loaded with one LDC, which is inspected according to approved receipt procedures. Removable contamination levels on the exterior of the shipping cask and cask dose rates are measured prior to close physical inspection. Once the inspection is completed and the documentation package accompanying the shipment is accepted, the tunnel door is opened, and the transport vehicle is backed into the tunnel. The truck is uncoupled from the trailer and exits the tunnel. The trailer is leveled and prepared for LDC unloading. LDC unloading operations are completed remotely using the canyon crane system. T Plant operations personnel will remove the shipping cask lid bolts, install the lid lifting device and evacuate the tunnel. The crane operator will then remove the cask lid and store it on the lid storage rack. The LDC is lifted out of the shipping cask and moved to a canyon storage cell and stored until treatment commences. After the LDC has been removed from the shipping cask, the lid will be replaced on the cask and operations personnel will re-enter the tunnel. After radiological surveys of the tunnel and the cask and trailer and after the lid bolts are installed and tightened, the truck will re-enter the tunnel, connect with the trailer, and exit the tunnel. The transport

vehicle and cask will be checked and released by radiological protection technicians prior to its movement out of the contamination area.

2.1.3 Stage the LDC at the Treatment Location

Cell cover blocks are removed starting with the key block and followed by the remaining three blocks. The LDC is remotely lifted from the cell and moved to the sludge treatment area. As low as reasonably achievable (ALARA) practices are followed to minimize occupational exposure. For example, shielding is placed around the LDC overpack to keep exposure ALARA. Scaffolding is erected around and over the LDC to allow operations personnel access to the top of the LDC and shielding is placed over the top of the LDC to keep exposure ALARA.

2.1.4 Prepare the LDC for Sludge Transfer

Operations personnel access the shielded LDC and remove the 12.7 centimeter (cm) [5 inch (in.)] level detector port cover. This allows for use of suction and water spray wands. The 7.6 cm (3 in.) clean out cap is removed to allow insertion of a high-level detection probe, the 5.1 cm (2 in.) high-efficiency particulate air (HEPA) vent plug is removed to allow connection to a portable HEPA filtered exhauster, and the 5.1 cm (2 in.) water addition plug is removed to allow insertion of the video camera to allow for visual observation of the process.

2.1.5 Transfer Sludge from LDC to Grouting System

The LDC sludge retrieval wand enters the LDC at the 12.7 cm (5 in.) Level Detector Nozzle of the LDC. The wand fluidizes the sludge at the tip of the wand within the LDC and transfers it to the grouting system buffer tank. Water from the grouting system is recirculated back into the LDC to locally fluidize the compacted sludge layer and improve the pumpability of the LDC solids. The transfer system also uses clean water to rinse the suction wand prior to removal, add water to the LDC to improve solids fluidization, assist in wash down of the side and bottom of the LDC, and clear any piping that may plug during sludge transfer. These wands will be plastic sleeved when extracted for safe storage between uses.

After transfer of the sludge and the LDC is confirmed empty, the LDC will be placed back into a process cell for future treatment and disposal.

2.1.6 Determine Volume of Sludge to be Loaded in Drums

The sludge and water solution in the buffer tank is agitated to achieve a homogenous solution and is circulated past a gamma radiation detector to determine the radioactive dose rate of the circulated sludge. This measurement is used to ascertain the amount of sludge to be added to the drum to maintain CH dose rates. This is accomplished by comparing the reading to a nomagram developed by Pacific Northwest National Laboratories (PNNL). The number of waste drums produced will be minimized while controlling the process at a set point below the acceptance criteria for CH containers using a contact dose rate goal of 180 millirem per hour per container.

2.1.7 Prepare and Stage the Drum

An empty drum is placed on the mixer enclosure inlet conveyor, the tamper indicating seal and lid are removed and a mixer blade is placed in the drum. The mixing enclosure inlet door is opened and the drum is moved inside the mixer enclosure and the door is closed. The mixer is a pneumatic/hydraulically operated unit with a detachable mixing blade. The blade is attached to the shaft and the mixer cover plate is lowered and sealed to the top of the drum to prevent sludge from spilling/splashing outside of the drum during loading and blending. To reduce radiological exposure to the worker during processing, shielding has been incorporated into the design of the grouting system. The shielding will reduce personnel exposure, while allowing access to the drum for radiological surveys, drum completion and ease of drum removal.

2.1.8 Load Sludge and Blend Additives into Drum

The system design incorporates a process for the automatic transfer of a specified volume of sludge into the drum (refer to Section 2.1.6). Once sludge is added, water is transferred using the same process and the grout formers are added to the drum and blending/mixing begins. Blending continues for approximately 15 minutes with total blending/mixing time of at least 30 minutes. Dust from the blend additive loading process is minimized by design, ventilation and conduct of operations in the mixing enclosure.

2.1.9 Staging of Drums

After blending is complete and before the mixture begins to harden, the blade is decoupled from the mixer and allowed to settle into the grout mixture and the mixer cover plate is retracted. The drum is then conveyed to a "lidding station" where additional bentonite clay will be added at the top of the mixture for free liquid absorption. Void filler will be added prior to placing a vented lid on the drum. A drum lid installation tool may be used to minimize radioactive dose to the workers. The outlet door to the mixer station is opened and the drum is conveyed to the inspection station and the outlet door to the mixing station is closed. The lid ring is tightened. The grouting system allows for the drum to be transferred out of the enclosure with minimal worker interface.

2.1.10 Storage of Drums

Visual Examination Personnel will observe all KE Basin NLOP sludge treatment operations that affect the waste matrix and will determine which drums require inspection for absence of free liquids. They will document their decisions and findings and include that paperwork as part of the WIPP certification package. Once the drum lid is installed, the weight of the grouted drum is recorded. Radiological surveys are performed and recorded and the drum is placed on a pallet for storage.

If a drum exceeds the dose rate limits for CH TRU waste, one of the following two options may be applied:

- the drum may be overpacked in a larger container that contains a blend of high and lower dose drums; or
- the drum may be certified as remote-handled (RH) TRU waste with balance-of-sludge containers.

2.2 PROCESS REQUIREMENTS

The modified sludge remedy identifies two predominant waste treatment criteria that must be achieved to prepare the waste for disposal and to place the sludge in a safer configuration:

- The treated sludge can contain no drainable liquids; and
- The treated sludge must not generate hydrogen to the extent of requiring stringent engineering and administrative controls.

The modified sludge remedy also specifies that there are no sludge treatment performance standards with respect to PCBs. Therefore, systems specific for the treatment or destruction of PCBs in the sludge are not required.

The solidification process will immobilize the sludge in grout to bind up free liquid. In addition, waste loadings can be maintained or reduced, as appropriate, to bind up free liquid as well as reduce radiolytic hydrogen generation.

The overall processing system will accommodate the inventory of KE Basin NLOP sludge and sand within the scope of this action. The process will produce a certifiable CH TRU waste form, or other waste form to be dispositioned as appropriate.

2.3 OPERATIONAL EFFECTIVENESS

The aforementioned system shall be capable of processing approximately one drum per production hour with equipment setup, maintenance, and operations accomplished with individual worker annual dose equivalent minimized based on ALARA principles.

2.4 PREFERRED TECHNOLOGY AND JUSTIFICATION

The modified remedy identified in the ROD amendment adds sludge treatment to the scope of the K Basins Interim Remedial Action. The basis for this remedy is documented in the focused feasibility study addendum (DOE/RL-98-66, Addendum) and the aforementioned ROD amendment (EPA 2005b).

The sludge treatment technology for NLOP sludge described herein is solidification. This technology was chosen based on testing conducted at the 325 Building at the Hanford Site. The test results, which serve as the justification for choosing solidification, are provided in PNNL 2004.

3.0 APPLICABLE LAWS AND REGULATIONS

Sludge treatment will be performed at T Plant in accordance with the CERCLA offsite provision of 40 CFR 300.440(a)(4). In accordance with 40 CFR 300.440(a)(4), treatment at T Plant will be performed in compliance with both the substantive and administrative provisions of all applicable state and federal requirements instead of ARARs. This section addresses the regulatory requirements applicable to sludge treatment and packaging at T Plant, including permits and approvals.

3.1 REGULATIONS PURSUANT TO TOXIC SUBSTANCES CONTROL ACT (TSCA)

The KE Basins NLOP sludge is a multiphasic PCB remediation waste. The KE Basin NLOP sludge treatment system will be designed and operated according to the *Risk-Based Disposal Approval for PCBs in North Loadout Pit Sludge* (RBDA) (HNF-25697, April 2005).

The requirements for PCB waste to be certifiable for disposal at WIPP can be met without treatment, and WIPP meets the applicable requirements for a PCB disposal facility. Thus the solidification process design does not require sludge treatment performance specifications for PCBs.

EPA approved the RBDA on July 1, 2005 (EPA 2005c)

3.2 REGULATIONS PURSUANT TO THE CLEAN AIR ACT OF 1990, AND AMENDMENTS, AND THE WASHINGTON CLEAN AIR ACT

Airborne emissions from T Plant will result from NLOP sludge treatment and packaging operations. The following sections address radiological and nonradiological airborne air emissions.

3.2.1 40 CFR Part 61, "National Emissions Standards for Hazardous Air Pollutants"; Washington Administrative Code (WAC) 246-247, "Radiation Protection Air Emissions"; and WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides"

Activities at T Plant will result in airborne emissions of radionuclides. Radiological air emissions controls and systems for NLOP sludge treatment are described in DOE/RL-2004-50, "Radioactive Air Emissions Notice of Construction for Consolidated T Plant Operations." For example, the existing 221-T ventilation system has been established as providing best available radionuclide control technology (BARCT) for the KE Basin NLOP sludge operations and will be used to control emissions from sludge treatment activities upstream of the 291-T-1 exhaust stack. One stage of pre-filtration is combined with two stages of HEPA filters leak tested in place annually to verify a minimum control efficiency of 99.95% for each HEPA stage.

More specifically addressing abatement control for the NLOP sludge treatment and packaging system, the confinement of sludge is assured by use of HEPA filtered exhausters drawing from 4 points: the LDC being emptied, the transfer pump enclosure containment, the buffer tank enclosure containment and the drum mixer enclosure containment. One exhauster handles the first three services, and two exhausters are used for the drum mixer enclosure. The system is designed to maintain a minimum of 63.5 cm per second (125 feet per minute) air velocity at any opening from the containments during normal operating conditions. One HEPA exhauster (GVS-EXH-301) draws from the LDC through a 3.8 cm (1.5 in.) suction hose, the transfer pump containment through a 15.2 cm (6 in.) connection, and from the buffer tank containment through an 20.3 cm (8 in.) duct. The LDC and the transfer pump containment are served by a common line, with balancing of air flow accomplished via use of a 15.2 cm (6 in.) butterfly valve at the transfer pump containment connection point. There are dampers on the exhauster to balance flow through this common line with the line servicing the buffer tank containment.

Two other HEPA exhausters (GVS-EXH-101 and GVS-EXH-201) are used in parallel to provide ventilation for the grout mixer enclosure containment. The drum entry and exit doors are interlocked to prevent more than one door being open simultaneously. Back flow dampers are equipped on the grout

mixing enclosure containment, the transfer pump containment and the buffer tank containment to allow air flow to enter the enclosures, but close off if other air flow paths become available.

Each HEPA exhauster exhausts into the 221-T Canyon air space after being filtered by a single stage HEPA. The exhausters are tested annually to verify the filters perform as required. Negative differential pressure is maintained in the 221-T Canyon as long as the canyon ventilation stack fans are operating (HEPA-filtered exhaust).

Approvals associated with radioactive air emissions have been obtained from Washington State Department of Health (WDOH) and EPA. Specifically, WDOH approved the aforementioned Notice of Construction (NOC) on April 26, 2005 (AIR 05-408), and EPA approved the NOC on April 5, 2005 (EPA 2005a). Approval from EPA was obtained earlier for alternative flow measurement on March 26, 2003 (EPA 2003).

3.2.2 WAC 173-400, "General Regulations for Air Pollution Sources"

Airborne emissions of criteria pollutants were considered for NLOP treatment activities. No specific approvals are required, as the use of existing abatement controls required for radioactive airborne emissions is adequate to satisfy best available control technology (BACT) for particulate criteria pollutants and use of the mixing enclosure satisfies reasonable available control technology (RACT) for criteria particulate.

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

Airborne emissions of toxic air pollutants (TAPs) were considered for NLOP treatment activities. No specific approvals are required, because no TAPs emissions are expected to exceed small quantity emission rates.

3.3 REGULATIONS PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA)

The activities described in Section 2.0 were addressed in DOE/EIS-0286F, *Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement.* In the associated Record of Decision (69 Federal Register 39449), DOE determined that storage, processing and certification of TRU waste for subsequent shipment to WIPP will occur at existing and modified onsite facilities (in this instance, T Plant).

4.0 REMEDIAL ACTION WORK PLAN

4.1 PROJECT SCHEDULE AND COST

The schedule and cost associated with the treatment of 105-K East NLOP sludge at T Plant is identified in Tables 1 and 2.

Table 1. Completion Dates for the Activities associated with the Treatment of KE Basin NLOP Sludge at T Plant

Completion Dates	Activity
October 2003	Contract with PNNL to study sludge and determine best treatment option for KE BASIN NLOP Sludge
December 2003	Contract with PNNL to develop KE Basin NLOP Treatment System
March 2004	Re-baseline PNNL efforts to develop KE Basin NLOP Sludge Treatment System
June 2004	Change PNNL contract to install KE Basin NLOP Treatment System in T Plant
August 2004	Turnover KE Basin NLOP Documentation to FH for transfer to Subcontractor
October 2004	Kick Off Subcontractor Design Build for Production Model KE Basin NLOP Treatment System
October 2004	Deliver Prototype KE Basin NLOP Treatment System To Sub Contractor
February 2005	Subcontractor Design Complete
March 2005	Fabrication Complete
March 2005	Acceptance Test Plan Complete at Subcontractor
June 2005	Installation of treatment system Complete at T Plant
July 2005	Operational Testing Complete at T Plant
August 2005	Operation Readiness Review Complete
September 2005	Start up
2005-2007	Treat KE Basin NLOP Sludge
2006-2008	Treat KE Basin Sand Filter Sand
2006-2008	Waste Certification at WRAP for Shipment to WIPP*
2012 (early finish)	Shipment to WIPP
2024 (late finish)	Shipment to WIPP

*Not in scope of this remedial action (refer to Section 1.4).
Note: Shading represents activities completed to date.

Table 2. Activities and Cost Associated with 105-K East Basin Treatment and Shipment of NLOP Sludge.

Activity	Cost in Thousand Dollars*
PNNL Treatment Options	425
PNNL KE Basin NLOP Prototype Design	2212
Subcontractor Production Design Build	2225
Installation and Testing at T Plant	1273
Training and Readiness Activities	1212
Treatment of Sludge/Sand	755
Waste Certification for Shipment to WIPP	235

*Costs for activities completed as of June 2005 are real costs; future costs are estimated.

4.2 PLANNING AND DOCUMENTATION

The Hanford Site ensures waste properly is characterized for shipment to WIPP or disposal at ERDF, as appropriate. Various waste characterization activities are completed to provide much of the data upon which WIPP certification decisions are based. These characterization activities include nondestructive examination to help verify the physical contents of the waste, NDA to determine the radionuclide content of the waste, headspace gas sampling to determine volatile organic compound content of gases in the void volume of the containers, sampling (as appropriate) of homogenous waste forms to determine the

characteristics of ignitability, corrosivity or reactivity, and compilation of acceptable knowledge documentation into an auditable record.

Sampling and analysis plans for the characterization of waste associated with these activities are listed as follows:

- HNF-6479, Rev. 0, *Sampling and Analysis Plan for Sludge From the 105-K Basins to Support Transport to and Storage in T Plant*
- SNF-20878, Rev. 1, *Sampling and Analysis Plan for Waste Disposition of Treated KE Basin North Loadout Pit Sludge Determined to be Low-Level Waste*
- SNF-20879, Rev. 1, *Sampling and Analysis Plan for Waste Disposition of Empty Large-Diameter Containers Contaminated with KE Basin North Loadout Pit Sludge.*

5.0 PROJECT CLOSURE DOCUMENTATION

The Project Closure Documentation is outlined in DOE/RL-99-89 and not repeated here.

6.0 REFERENCES

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

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

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

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

40 CFR 61, *National Emissions Standards for Hazardous Air Pollutants.*

40 CFR 300, *National Oil and Hazardous Substances Pollution Contingency Plan.*

69 FR 39449, "Record of Decision for the Solid Waste Program, Hanford Site, Richland, WA: Storage and Treatment of Low-Level Waste and Mixed Low-Level Waste; Disposal of Low-Level Waste and Mixed Low-Level Waste, and Storage, Processing, and Certification of Transuranic Waste for Shipment to the Waste Isolation Pilot Plant".

AIR 05-408, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Consolidated T Plant Operations" April 26, 2005.

DOE, 2005, Letter to N. Ceto (EPA) from M.S. McCormick (DOE-RL), "Transmittal of 100 K Area K Basins Interim Remedial Action Record of Decision Amendment", 05-AMCP-0308, dated June 23, 2005, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/EIS-0286F, *Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement.*

DOE/RL-98-66, *Addendum to the Focused Feasibility Study for the K Basins Interim Remedial Action*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-99-89, *Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington, (December 2001).

DOE/RL-2004-50, *Radioactive Air Emissions Notice of Construction for Consolidated T Plant Operations*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/WIPP-02-3122, *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, Rev 2, (November 2004).

Ecology, EPA, and DOE-RL, 2001, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Richland Operations Office, Olympia, Washington, amended periodically.

EPA, 2003, Letter B. Wiese (EPA, Region 10), to J. B. Hebdon (DOE-RL), "Approval of Alternative Flow Measurement Method for 291-T-1 Stack", dated March 26, 2003, U.S. Environmental Protection Agency.

EPA, 2005a, Letter R. Albright (EPA, Region 10), to K. A. Klein (DOE-RL), "Notice of Construction for Consolidated T-Plant Operations," AWT-107, dated April 5, 2005, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2005b, *Interim Remedial Action Record of Decision Amendment, U.S. Department of Energy, 100 K Area K Basins, Hanford Site - 100 Area, Benton County Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington, June 2005.

EPA, 2005c, Letter, M. A. Bussell (EPA, Region 10), to K. A. Klein (DOE-RL), "Approval of the Toxic Substance Control Act (TSCA) Risk-based Disposal Approval (RBDA) Application for Treatment of Polychlorinated Biphenyls (PCBs) from the Hanford K-Basins North Loadout Pit in T-Plant," OCE-164, July 1, 2005, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

HNF-6479, 2000, *Sampling and Analysis Plan for Sludge From the 105-K Basins to Support Transport to and Storage in T Plant*, Fluor Hanford, Richland, Washington.

HNF-25697, 2005, "Risk-Based Disposal Approval for PCBs in North Loadout Pit Sludge," Fluor Hanford, Richland, Washington.

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, latest revision, Fluor Hanford, Richland, Washington.

HNF-SD-SNF-IT-009, 2001, *105-K Basin Material Design Basis Feed Description for Spent Nuclear Fuel Project Facilities, Volume 2, Sludge*, Rev. 4, Fluor Hanford, Richland, Washington.

PNNL, 2004 *Evaluation and Recommendation of Waste Form and Packaging for Disposition of the K East Basin North Loadout Pit Sludge*, 46857 - RPT01, Pacific Northwest National Laboratory, Richland, Washington.

SNF-20878, Rev. 1, *Sampling and Analysis Plan for Waste Disposition of Treated KE Basin North Loadout Pit Sludge Determined to be Low-Level Waste*, Fluor Hanford, Richland, Washington.

SNF-20879, Rev. 1, *Sampling and Analysis Plan for Waste Disposition of Empty Large-Diameter Containers Contaminated with KE Basin North Loadout Pit Sludge,* Fluor Hanford, Richland, Washington.

This page intentionally left blank.