Document ID:EDF-3077
Revision ID:1
Effective Date:12/02/04

Engineering Design File

PROJECT NO. 22901

Risk-Based Approach for Management of PCB Remediation Waste from the V-Tanks

Idaho National Engineering and Environmental Laboratory

Form 412.14
10/9/2003
Rev. 05

ENGINEERING DESIGN FILE

EDF No.: 3077 EDF Rev. No.: 1 Project File No.: 22901

1. Title: Risk-Based Approach for Management of PCB Remediation Waste from the V-Tanks

2. Index Codes:
   Building/Type 1704 SSC ID N/A Site Area TAN

3. NPH Performance Category: _____ or ☒ N/A

4. EDF Safety Category: CG or ☐ N/A SCC Safety Category: _____ or ☒ N/A

5. Summary:

Summary: This document provides a management approach for the PCBs contained within the V-Tanks that will not pose an unreasonable risk of injury to health or the environment as defined in 40 CFR 761.61(c). Revision 0 of this EDF explained the risk-based management approach for PCB remediation waste from the V-Tanks and was incorporated by reference into the V-Tanks ROD Amendment issued in February of 2004. Revision 1 of EDF addresses the risk-based management of those same PCBs for a revised remedy that will be explained in the V-Tanks Explanation of Significant Differences (ESD). The primary change to the remedy is that sparging of volatile organic compounds (VOCs) will be conducted after waste consolidation. This sparging may remove and allow collection of sufficient VOCs to meet the LDR treatment standard. If the treatment standards are met, then chemical oxidation will not be conducted and the waste will be sent directly to stabilization and then disposal. If treatment standards are not met after sparging, chemical oxidation will take place prior to stabilization and disposal.

This document will be incorporated by reference into the V-Tanks ESD that is being developed concurrently. Signature of that ESD by the agencies (EPA, DOE, and State of Idaho) constitutes the CERCLA approval equivalent to the TSCA approval needed for projects not addressed under the INEEL Federal Facility Agreement and Consent Order. This approval is necessary for the operation of processes such as chemical oxidation/reduction that are capable of destroying the PCBs in liquid PCB Remediation Waste and for the conversion of liquid PCB Remediation Waste into solid PCB Remediation Waste. This EDF documents that this approach is acceptable as it does not pose an unreasonable risk of injury to health or the environment.

6. Review (R) and Approval (A) and Acceptance (Ac) Signatures:
   (See instructions for definitions of terms and significance of signatures.)

	R/A	Typed Name/Organization	Signature	Date
Author	R	David L. Eaton		12/2/04
Author	R	William J. Becker	William J. Becker by Jenni M. Orton Per Telecon	12-2-04
Author	R	Robert L. Nitschke	Robert L. Nitschke by Jenni M. Orton Per Telecon	12-2-04
Technical Checker				
Independent Peer Reviewer (if applicable)	R	Robert A. Montgomery		12/2/04
Approver	A			
Requestor (if applicable)	A	James J. Jessmore		12/2/04
Doc. Control		Jenni M. Orton	Jenni Marie Orton	12-7-04

7. Distribution: (Name and Mail Stop) A. E. Jantz MS 2510, J. J. Jessmore MS 2510, G. E. McDannel MS 2510

EDF No.: 3077 EDF Rev. No.: 1 Project File No.: 22901

1. Title: Risk-Based Approach for Management of PCB Remediation Waste from the V-Tanks
2. Index Codes:
   Building/Type 1704 SSC ID N/A Site Area TAN

8. Does document contain sensitive unclassified information? ☐ Yes ☒ No
   If Yes, what category:

9. Can document be externally distributed? ☒ Yes ☐ No
10. Uniform File Code: 0250; 6102 Disposition Authority: A16-3-A; ENV1-h-1
    Record Retention Period: Permanent
11. For QA Records Classification Only: ☐ Lifetime ☐ Nonpermanent ☐ Permanent
    Item and activity to which the QA Record apply:
12. NRC related? ☐ Yes ☒ No

13. Registered Professional Engineer's Stamp (if required)

CONTENTS

ACRONYMS 5

1. INTRODUCTION 7

2. BACKGROUND 7

   2.1 History 7

   2.2 Waste Description 9

   2.3 PCB Content 10

   2.4 Lack of Available Treatment 11

3. PLANNED TREATMENT PROCESS DESCRIPTION 11

4. DISPOSAL 12

5. REGULATORY BASIS 13

6. SAFETY/RISK 14

   6.1 Disposal Facility Risk Comparison 14

   6.2 Overall Safety/Risk Management 16

7. CONCLUSION 18

8. REFERENCES 19

FIGURES

1. Location of Test Area North at the INEEL Site 8

TABLES

1. V-Tanks capacity and volume of contents (in gallons; data rounded) 8

2. V-Tanks major RCRA constituents 10

3. V-Tanks major radionuclides 10

4. Average PCB concentration in V-Tanks waste 11

5. Risk summary table for V-Tanks modified remedy 15

This page intentionally left blank.

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DOE Idaho	U.S. Department of Energy Idaho Operations Office
DSA	documented safety analysis
EDF	engineering design file
ELCR	excess lifetime cancer risk
ESD	explanation of significant differences
FFA/CO	Federal Facility Agreement and Consent Order
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
ISMS	Integrated Safety Management System
LDR	land disposal restrictions
MCP	management control procedure
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
RCRA	Resource Conservation and Recovery Act
ROD	record of decision
RWP	radiation work permit
TAN	Test Area North
TCE	trichloroethylene
TSCA	Toxic Substances Control Act
VOC	volatile organic compound
WAC	waste acceptance criteria

This page intentionally left blank.

Risk-Based Approach for Management of PCB Remediation Waste from the V-Tanks

1. INTRODUCTION

The U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (DEQ) (the Agencies) have entered into a Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) to manage the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup at the Idaho National Engineering and Environmental Laboratory (INEEL). These agencies have selected volatile organic compound (VOC) sparging, chemical oxidation/reduction as necessary, and stabilization as the preferred treatment alternative for the waste presently stored within the V-Tanks, which are located at Test Area North (TAN) at the INEEL. If treatment systems such as chemical oxidation/reduction are used on waste subject to Toxic Substances Control Act (TSCA), the TSCA regulations (15 USC 2601 et seq.) require approval of those treatment systems. TSCA regulations also require prior approval before converting liquid polychlorinated biphenyl (PCB) remediation waste into solid PCB remediation waste. TSCA regulations provide the option of obtaining this approval under a risk-based application for PCB remediation waste (40 CFR 761.61(c)) for waste such as that contained within the V-Tanks.

This Engineering Design File (EDF) will be placed in the INEEL Administrative Record and referenced in the *Explanation of Significant Differences for the Record of Decision for the Test Area North Operable Unit 1-10* (the V-Tanks ESD) (DOE/NE-ID 2004). The V-Tanks ESD, which is being prepared concurrently with this EDF, will document the Agencies' change to the revised remedy for the V-Tanks cleanup. Approval of the V-Tanks ESD by EPA will be the CERCLA equivalent of the approval demonstrating that the project poses no unreasonable risk of injury to health or the environment that would have been required under TSCA regulations if this were not a CERCLA remediation project.

2. BACKGROUND

2.1 History

The V-Tanks are being remediated as part of a CERCLA response action covered by the FFA/CO. The revised remedy for the V-Tanks was established in the *Record of Decision Amendment for the V-Tanks (TSF-09 and TSF-18) and Explanation of Significant Differences for the PM-2A Tanks CTSF-26 and TSF-06, Area 10 at Test Area North, Operable Unit 1-10* (the V-Tanks Record of Decision [ROD] Amendment) (DOE-ID 2004a). Information obtained during the Remedial Design phase has provided new information that VOC sparging of the V-Tanks waste stream may be effective in meeting the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDR) treatment requirements. Chemical oxidation/reduction may not be necessary if sparging is proven to be effective. The Agencies will explain this change revision to the selected remedy in the V-Tanks ESD.

The V-Tanks are designated as INEEL CERCLA sites TSF-09 and TSF-18. These tanks were part of the Intermediate Level Radioactive Waste Management System at TAN (see Figure 1). The V-Tanks include three 10,000-gal (37,850-L) underground storage tanks (Tanks V-1, V-2, and V-3) and one 400-gal (1,514-L) underground storage tank (Tank V-9). As shown in Table 1, the combined volume of waste in the tanks is approximately 12,000 gal, including 2,000 gal of sludge and 10,000 gal of liquid (INEEL 2003).

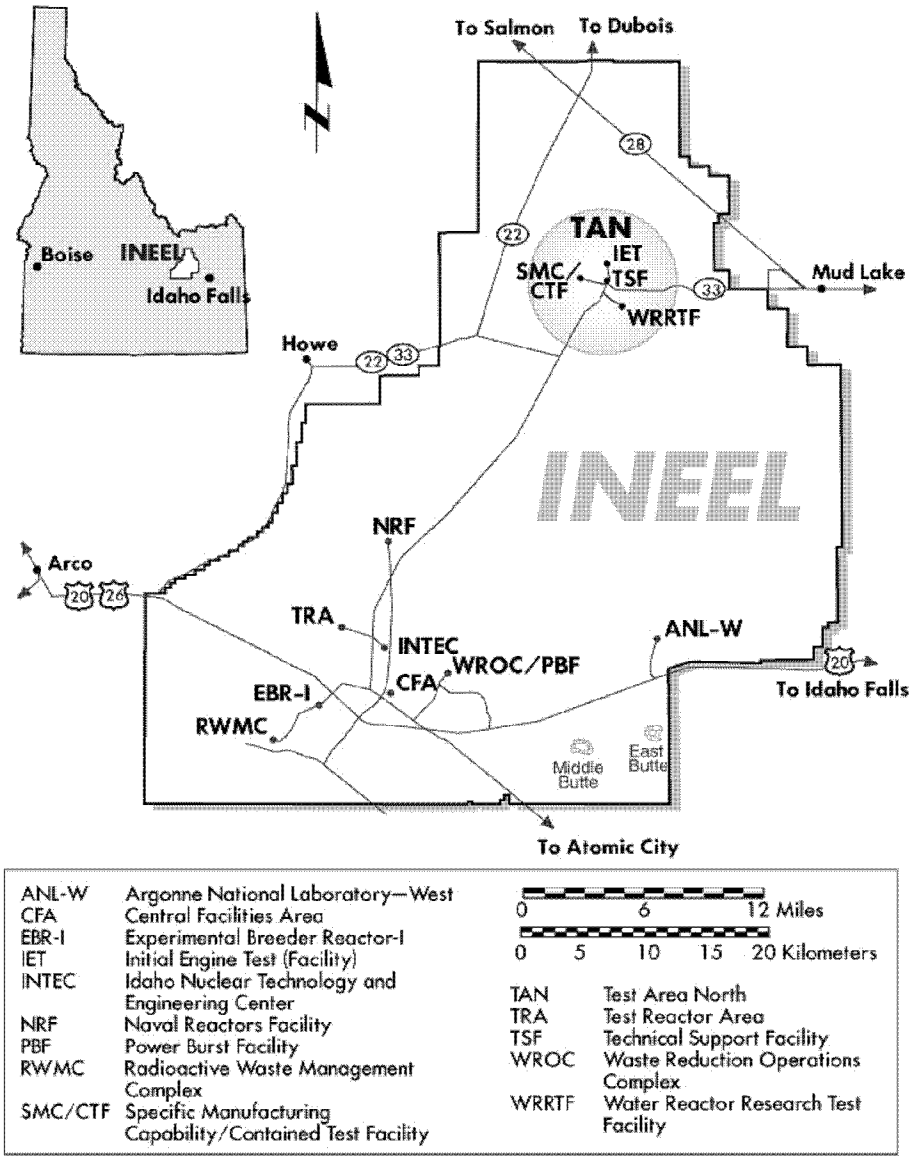

Figure 1. Location of Test Area North at the INEEL Site.

Table 1. V-Tanks capacity and volume of contents (in gallons; data rounded).

Tank	Capacity	Liquid	Sludge	Total
V-1	10,000	1,160	520	1,680
V-2	10,000	1,140	460	1,600
V-3	10,000	7,660	650	8,310
V-9	400	70	250	320
Total	30,400	10,030	+1,880	11,910

Source: *Technology Evaluation Report for the V-Tanks, TSF-09/18, at Waste Area Group 1, Operable Unit 1-10* (DOE-ID 2004b)

2.2 Waste Description

The V-Tanks, installed in the 1950s, were used to collect radioactive wastes during 30 years of operation. Wastes received were primarily the result of nuclear research activities. Tank V-9 served primarily as a solids separation unit while the other tanks were designed for accumulation and storage. The tanks contents comprise an aqueous sludge contaminated with radionuclides, inorganic contaminants (including RCRA toxic metals), and toxic organic compounds (including trichloroethylene [TCE], tetrachloroethylene [PCE], and PCBs). Nearly all of the contaminants in the V-Tanks are found in the solid phase of the sludge.

The four V-Tanks were operated as one tank system. There are only minor differences in concentrations of contaminants from one tank to the other. The tank system as a whole represents the wastes that were collected over the operational period for the tank system. The waste from the four tanks will be consolidated and managed as one waste stream in order to facilitate remediation of the waste from this tank system. Treatment will be based upon average concentrations of the consolidated waste stream.

The waste in the V-Tanks is classified as an F001 listed waste. This waste will be treated to meet the LDR treatment standards for all of the F001 listed constituents. Initial characterization efforts were inconclusive with respect to confirming that the V-Tanks waste was not characteristically hazardous for all 40 constituents listed in 40 CFR 261.24. The detection levels for eleven trace organic constituents exceeded the characteristic level due to interference in the chemical analysis. Subsequent review of process knowledge and an in-depth review of the analytical data provided the basis for concluding that the V-Tanks waste is non-characteristic. As such, there is no requirement to meet LDR treatment standards for underlying hazardous constituents under RCRA including PCBs.

The Idaho DEQ has requested that this noncharacteristic conclusion be confirmed after the constituents causing the interference have been removed. If these further analytical efforts do not confirm the previous conclusion that the waste is noncharacteristic, then the waste will be treated to meet the applicable characteristic treatment standards that include treating underlying hazardous constituents such as PCBs in addition to the F001 standard. If the waste is characteristic the final waste form must be less than 10 mg/kg total PCBs.

Tables 2 and 3 list the primary contaminants in the V-Tanks that affect the selection of an effective treatment remedy (DOE-ID 2004a). These tables list the overall average concentration of the major RCRA constituents and radionuclides in the V-Tanks. These values were used in evaluating the effectiveness and operability of various treatment alternatives. This evaluation led the Agencies to select chemical oxidation/reduction with stabilization as the appropriate treatment process for this waste.

Table 2. V-Tanks major RCRA constituents.

Constituent	mg/kg
Antimony	0.902
Arsenic	0.359
Barium	12.4
Beryllium	1.11
Cadmium	2.34
Chlorides	106
Chromium	297
Lead	36.1
Mercury	79.2
Nickel	16.4
Silver	18.4
Tetrachloroethylene (PCE)	118
1, 1, 1-Trichloroethane (TCA)	52.2
Trichloroethylene (TCE)	426
Bis-2-ethylhexyl phthalate (BEHP)	454
Aroclor-1260 (a PCB)	17.9

Source: V-Tanks ROD Amendment (DOE-ID 2004a)

Table 3. V-Tanks major radionuclides.

Radionuclides	nCi/g
Cesium-137	988
Strontium-90	1,840
Transuranics	4.27

Source: V-Tanks ROD Amendment (DOE-ID 2004a)

2.3 PCB Content

The waste in the tanks will be managed as one homogenous waste stream. The solids will not be separated from the aqueous phase. Because there are free liquids present, TSCA requires that the waste be managed as a multi-phase solution. The average PCB concentration of the solids phase is approximately 294 mg/kg. The average PCB concentration of the aqueous phase is less than 0.1 mg/kg. The overall average PCB concentration of all the waste currently in the V-Tanks is approximately 18 mg/kg.

If the generator chooses not to separate the phases of a multi-phase solution, then TSCA regulations require that the generator manage that waste stream according to the requirements that apply to the phase with the highest concentration. The regulations, therefore, require the wastes in the V-Tanks to be managed as if they were at a concentration of 294 mg/kg (see Table 4).

Table 4. Average PCB concentration in V-Tanks waste.

Tank	Liquid Phase (mg/kg)	Solid Phase (mg/kg)	Combined Sludge (mg/kg)
V-1	<0.1	394	35
V-2	<0.1	218	24
V-3	<0.1	310	10
V-9	0.036	285	96
Total	<0.1	294	18

Source: EDF-3858, "V-Tank Analytical Data – Calculated Averages and Upper Confidence Limits"

2.4 Lack of Available Treatment

The V-Tanks contain a variety of hazards, which makes finding a treatment alternative difficult. An acceptable treatment process conducted at a location other than the V-Tanks CERCLA site would not only require both RCRA and TSCA permits, but the facility would also have to be able to manage appropriate levels of radionuclides. In the original plan, this waste was to be shipped to a vitrification facility in the State of Washington that was being built to meet the necessary conditions. However, that facility never received an operating permit and there are no current plans to start the unit. DOE operates a facility in Tennessee that meets most of these conditions. However, the waste acceptance criteria (WAC) for this facility does not allow radioactivity at the levels contained within the V-Tanks. There are no known facilities within the United States that are capable of treating this waste at this time. The V-tanks ROD Amendment selected a new remedy for the treatment of the V-Tanks. The V-Tanks ESD, being prepared concurrently with this EDF, will explain a change to that remedy that will be specifically designed to address these multiple hazards.

3. PLANNED TREATMENT PROCESS DESCRIPTION

Bench-scale studies conducted to fine tune the treatment approach to the V-Tanks waste revealed that most of the volatile organic compounds were volatilized and could be removed through simple sparging of the waste. The V-Tanks ESD being prepared in conjunction with this EDF will explain a change to the remedy selected in the 2004 V-Tanks ROD Amendment that will take advantage of the potential to meet the treatment standards through this more simplistic treatment approach. While sparging of the waste at ambient or slightly elevated temperatures (up to and including boiling temperatures) may be sufficient to meet the LDR treatment standards, this will not be known for sure until this initial sparging has been completed. The revised remedy specifies that if sampling and analysis confirms that organic LDR treatment standards are met after sparging at ambient or slightly elevated temperatures (up to an including boiling temperatures), chemical oxidation of the waste will not be conducted. If organic LDR treatment standards are not met after this sparging, then chemical oxidation will be deployed. In all cases the waste will be solidified or stabilized as appropriate after the organic treatment standards are met and the final waste form will be sent to ICDF for disposal.

If sparing is not effective, chemical oxidation/reduction will still be necessary as was detailed in the ROD Amendment. The design of that system will be based upon the following information. The Conceptual Design Report (INEEL 2003) proposed a design where the waste from the V-Tanks will be removed and treated in small batches to destroy the hazardous organic contaminants. Chemical oxidation/reduction with stabilization remains as a potential treatment for this waste if unsuccessful as the best way to achieve this destruction necessary to meet the applicable treatment standards. Primary

considerations in retaining chemical oxidation include: (1) destruction to meet regulatory limits; (2) off-gas emission levels; (3) secondary wastes produced; (4) process safety; (5) process simplicity; and (6) operation in a radioactive environment, with alpha, beta, and gamma emitters present in the waste. Chemical oxidation/reduction was chosen because of low operating temperature (<100°C) and low off-gas flow rate as well as the ability to be tailored to a specific waste stream, and to recover from any process upsets.

If chemical oxidation is determined to still be required, it will be designed and deployed based upon treatment studies. Due to the complex nature of the V-Tanks waste stream, the INEEL sponsored a cold bench-scale study that assisted in developing an appropriate recipe that details the best oxidant or reductant to use along with appropriate residence times, pH control, temperature control, and the possible addition of specific catalysts. The waste in the V-Tanks will be consolidated and blended as appropriate to produce a single homogenous waste stream that can undergo routine treatment according to the recipe developed in the bench-scale studies. The recipe developed as part of the bench-scale studies was tailored to target the destruction of specific organic compounds (especially TCE, 1,1,1-Trichloroethane [TCA], and PCE) to meet applicable or relevant and appropriate requirements (ARARs), land disposal restrictions (LDRs) and reduce PCBs to the extent practical. Dependent upon further characterization efforts, other underlying hazardous constituents, such as bis-2-ethylhexyl phthalate (BEHP), will be targets for destruction. Although the laboratory studies were designed to optimize treatment of volatile organic compounds (VOCs), it is expected that some PCB destruction will take place during the chemical oxidation/reduction step. The extent of PCB destruction is uncertain.

The Conceptual Design Report called for the off-gas from the treatment process to be controlled to prevent unacceptable emissions. First, as part of the treatment process, a condenser would recycle most of the volatilized water and organics back into the treatment process. Depending upon the success of the laboratory studies, the volatile halogenated organic compounds may be destroyed ex Situ rather than be recycled back to the main waste stream. Secondary off-gas controls typically include high-efficiency particulate air (HEPA) filters, activated carbon absorbents for VOCs and, potentially, sulfur-impregnated granular activated carbon filters to control mercury. Details of the off-gas system and associated operating limits will be presented in the Remedial Design/Remedial Action Work Plan.

If the chemical oxidation/reduction step is deployed, it will be followed by a stabilization step that would produce a solidified waste form and reduce the mobility of both the RCRA toxic metals and the radioactive constituents. Any PCBs that were not destroyed in the chemical oxidation/reduction step would be rendered non-liquid in this step. The solidified waste will then be sent to the INEEL CERCLA Disposal Facility (ICDF) for disposal. Prior to shipping, the waste will be tested to confirm that it complies with RCRA LDRs and the ICDF WAC. The ICDF is regulated under CERCLA and meets the substantive requirements of a RCRA Subtitle C permit and the substantive requirements of a chemical waste landfill under TSCA.

4. DISPOSAL

The ICDF, which is identified in the V-Tanks ROD Amendment as the selected disposal facility, is a landfill with an engineered multiple-liner system designed to safely contain contaminated soils from cleanup operations across the INEEL. More specifically, the ICDF is designed for the disposal of hazardous, low-level, mixed low-level, and PCB-contaminated soil and debris wastes that (1) are generated by CERCLA remedial and removal actions at the INEEL and (2) meet the ICDF WAC. The ICDF landfill meets the substantive requirements of PCB landfill design and construction requirements under RCRA Subtitle C (42 USC 6921 et seq.), the Idaho Hazardous Waste Management Act (Idaho Code § 39-4401), DOE Order 435.1, and TSCA (15 USC 2601 et seq.). The ICDF landfill utilizes

a modular design consisting of two cells. The disposal cells, including a buffer zone, cover approximately 40 acres, and have a disposal capacity of about 510,000 yd^3. The facility is designed for an operating life of 15 years, a post-closure period of 30 years, and an expected cap design-life of 1,000 years.

The ICDF WAC was developed through a risk-based determination based on the maximum contaminant design inventory and planned maximum disposal capacity (see Appendix A to *Waste Acceptance Criteria for ICDF Landfill* [DOE-ID 2004c]). The PCB concentration in the treated V-Tanks waste will be significantly less than the ICDF WAC PCB risk-based limit and will represent only a miniscule fraction of the volume of waste being disposed of at the ICDF. For these reasons, the disposal of the remaining PCBs after treatment of the V-Tanks wastes is expected to have no measurable effect on the long-term risk to the ICDF.

5. REGULATORY BASIS

In the preamble language (63 FR 124) where EPA promulgated rules for PCB Remediation Waste, the EPA responded to commenters' questions concerning the applicability of 40 CFR 761.61 as an applicable or relevant and appropriate requirement (ARAR) by stating that:

> "EPA anticipates that today's rule will be a potential ARAR at CERCLA sites where PCBs are present. EPA would expect that CERCLA cleanups would typically comply with the substantive requirements of one of the three options, provided by 761.61, upon completion of the cleanups. This decision would not be made by the facility, but in the remedy selection process."

This remedy change will be explained in the V-Tanks ESD, being developed concurrently with this EDF. Through this process the Agencies (EPA, DEQ, and DOE) are changing the selected remedy to VOC sparging, chemical oxidation/reduction as necessary, followed by stabilization. The V-Tanks ROD Amendment specified 40 CFR 761.61(c) as the ARAR applicable for management of PCB contaminated wastes for this remedial action. 40 CFR 761.61(c) allows for the treatment and solidification of multi-phase solutions under a risk-based approval process. Specifically, the regulation allows "any person wishing to sample, cleanup, or dispose of PCB remediation waste in a manner other than prescribed…to apply in writing to the EPA Regional Administrator in the Region where the site is located" for approval of a risk-based method that "will not pose an unreasonable risk of injury to health or the environment."

The need for this risk-based approval and the proposed management approach are outlined as follows:

- Under TSCA regulations, separate analyses of the liquid phase (< 0.1 mg/kg) and the sludge phase (294 mg/kg) are required. If the waste is not phase-separated, the combined waste must be managed as if the combined waste were at the concentration of the higher phase (40 CFR 761.1(b)(4)(iv)). The waste in the V-Tanks will, therefore, be managed as a multi-phasic waste, that is, as if the concentration were 294 mg/kg rather than the approximate 18 mg/kg average concentration that now exists.

- The PCBs in the V-Tanks waste are the result of historical spills or unauthorized releases of PCB-containing materials from nuclear testing and development activities at TAN. Drains from within the TAN facilities collected spilled materials and routed the waste to the V-Tanks. The V-Tanks were installed for the express purpose of collecting waste products from TAN activities for appropriate management (i.e., as pollution control devices). The waste in the V-Tanks (an aqueous industrial sludge) meets the definition of bulk PCB remediation waste under 40 CFR 761.3.

- Bulk PCB remediation wastes with a concentration greater than 50 ppm may be disposed of without treatment in a hazardous waste landfill (40 CFR 761.61(a)(5)(iii)). For CERCLA wastes, the ICDF is equivalent to a hazardous waste landfill and, therefore, may receive the stabilized V-Tanks wastes for disposal. The V-Tanks waste, which is classified as a PCB remediation waste, is not subject to any limits on PCB concentration for disposal at ICDF. However, the V-Tanks waste also meets the ICDF WAC for PCB contaminated soils established at 500 ppm.

- TSCA prohibits the land disposal of wastes with PCB concentrations greater than 50 mg/kg that fail the paint filter test. TSCA also prohibits the solidification of these wastes to pass the paint filter test unless a risk-based application is approved under 40 CFR 761.61(c). Implementation of the revised remedy from the V-Tanks ESD will result in a waste that will pass the paint filter test, will be acceptable for disposal at ICDF, and will not pose an unreasonable risk of injury to health or the environment.

- If VOC sparging is not effective in meeting LDR treatment standards, the revised remedy specifies that chemical oxidation/reduction will be implemented and may destroy some of the PCBs thereby requiring EPA approval under 40 CFR 761.61(c).

The ARAR 40 CFR 761.61(c), as mentioned above, provides for the sampling, cleanup, treatment, and disposal of PCB remediation waste in a manner other than described in 40 CFR 761.61(a) or (b) provided EPA finds that the method will not pose unreasonable risk of injury to health or the environment. EPA's evaluation of this method considers the planned treatment for the V-tanks waste as well as the final disposition of the treated waste at the ICDF. This EDF contains documentation of the requirement to demonstrate no unreasonable risk. This document will be placed in the Administrative Record for OU 1-10. Signature by EPA of the V-Tanks ESD confirms the EPA finding of no unreasonable risk of injury to health or the environment under 40 CFR 761.61c.

6. SAFETY/RISK

6.1 Disposal Facility Risk Comparison

The consolidated V-Tanks waste will include the waste from V-1, V-2, V-3, and V-9 as well as returned V-Tanks sample waste, ARA-16 waste, and OU 1-07B waste. Aroclor 1260 was the primary PCB Aroclor detected in the V-Tanks waste. EDF-4928 summarizes sampling results for the V-Tanks. Based upon these results, the average concentration of Aroclor 1260 in the V-Tanks is 18.0 mg/kg. These values were also used to calculate a mean (21.2 mg/kg) at the 95% UCL and a mean (24.2 mg/kg) based on the maximum value for each tank. To ensure conservativeness, the higher value based upon the mean of the individual tank maximums was utilized in the following risk comparison. Based upon a total waste mass of 43,323 kg the maximum mass of Aroclor 1260 is expected to be approximately 1.10 kg.

The ROD Amendment for OU 1-10 signed in February of 2004 (DOE-ID 2004a) was based upon substantive treatment of the PCBs. What "substantive" means is subject to interpretation, but is generally viewed as approximately a 50% destruction of the PCBs present in the waste. This revision of EDF-3077 supports an Explanation of Significant Differences (ESD) (DOE/NE-ID 2004) in order to change the remedy selected in the ROD Amendment. The change involves the potential to eliminate the organic destruction process (with inherent destruction of PCBs) that was the basis of the remedy selected in the ROD Amendment. To support the ESD, the following risk comparison demonstrates that the change from an expected 50% destruction to no destruction will not result in a significant increase to the risk of injury to human health or the environment. This change leaves the entire original maximum mass of Aroclor

1260 in the final waste form (1.10 kg), which is an approximate increase of 0.55 kg of Aroclor 1260 over the mass expected prior to the change in remedy.

Table 5 below summarizes a comparison of the PCBs in the V-Tanks waste to the ICDF limits. The table also shows an estimate of the incremental risk incurred by the changing of the remedy that does not treat PCBs. The information in the table is explained more fully in the text following the table.

Table 5. Risk summary table for V-Tanks modified remedy.

ICDF WAC PCB Concentration Limit	V-Tanks Average PCB Concentration (based upon max values)	ICDF WAC Inventory Limit	Mass of PCBs in V-Tanks	Incremental risk to MEI from V-Tank waste	Incremental risk to groundwater (based upon worst case assumption assuming all risk from PCBs)
No Limit	24.2 mg/kg	380,000 kg	1.10 kg	5.2E-10	1.4E-12

As presented above, a conservatively high value for the mean concentration of Aroclor-1260 is approximately 24.2 mg/kg (based upon the average of maximum values). This is well below the 500 mg/kg concentration limit for soils established in the *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2004c). The V-Tanks waste is considered a PCB remediation waste, which has no concentration-based limit for disposal at ICDF. The total mass (including minor quantities of additional waste streams to be added to the V-Tanks waste) of Aroclor-1260 is estimated to be 1.10 kg (based upon the average of maximum values). This quantity is less than 0.0003% of the 380,000 kg Landfill WAC maximum mass as presented in Table 3-3 (DOE-ID 2004c). The waste tracking system defined in the *INEEL CERCLA Disposal Facility Complex Remedial Action Work Plan* (DOE-ID 2003) ensures that all waste disposed of in the facility is recorded and that the cumulative total of each substance (including PCBs) does not exceed the approved WAC (DOE-ID 2004c).

The Waste Acceptance Criteria for ICDF Landfill (DOE-ID 2004c) documents the mass of specific chemical and radiological constituents that can be disposed of at the landfill. Compliance with the requirements of this document ensures protection of human health and the environment, including the Snake River Plain Aquifer. The ICDF Landfill is also designed to meet the applicable sections of TSCA PCB design and construction requirements (DOE-ID 2004c).

The "INEEL CERCLA Disposal Facility Design Inventory" (EDF-ER-264) provides the initial starting point for evaluation and determination of acceptable concentrations of specific contaminants. This document compiled conservative estimates of concentrations of contaminants and the amount of soil that were to be disposed of in the ICDF from the remediation of various CERCLA sites at the INEEL. The estimated total mass of each contaminant was evaluated in the *Leachate Contaminant Reduction Time Study* (EDF-ER-274) to provide a conservative estimate to assess worker exposure of landfill contaminants in the leachate evaporation ponds. The total masses from the design inventory (EDF-ER-264) and the leachate concentrations from the leachate study (EDF-ER-274) were used to assess risk to over the short-term to both the public and worker in the "INEEL CERCLA Disposal Facility Short-Term Risk Assessment" (EDF-ER-327). The results of this assessment indicate the design inventory is well within acceptable limits. The *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2004c) adjusted the constituent concentrations to maximize the WAC limits. The purpose was to increase the concentrations such that the RAOs or other limiting applicable or appropriate and relevant regulatory limits are approached but not exceeded. This approach is documented in Appendix A of the *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2004c).

Given the nature of the development of the WAC, it is difficult to directly assess the amount of risk or added risk to the receptors at the landfill as a result of the change to the treatment remedy for the V-Tanks. However a semi-qualitative approach is possible by discussing that portion of risk that a specific amount of a contaminant might contribute. Risks to workers and the public were analyzed in the "INEEL CERCLA Disposal Facility Short-Term Risk Assessment" (EDF-ER-327). This risk assessment based its evaluation upon an adjusted design inventory concentration for Aroclor 1260 of 422 kg. Based upon the multiple scenarios analyzed, the ICDF Landfill bulldozer operator scenario was calculated to produce the highest excess lifetime cancer risk (ELCR). The 422 kg Aroclor 1260 to be disposed of at ICDF contributes approximately 4E-7 or about 4% of the total ELCR to that operator. The additional 0.55 kg of untreated Aroclor 1260 that will remain in the final waste form as a result of the amended treatment remedy will proportionally account for only 0.0052 % of the total risk or 5.2E-10.

To ensure protection of the Snake River Plain Aquifer (SRPA), existing background concentrations in the aquifer were reviewed and combined with predicted peak groundwater concentrations resulting from waste disposed of at ICDF (at design infiltration rate of 0.0001 m/yr) and compared to MCLs (Appendix A of DOE-ID 2004c). The Aroclor 1260 in conjunction with all other contaminants was demonstrated to produce a risk less than 1E-6. If it is assumed that the mass of Aroclor 1260 (380,000 kg) allowed to be disposed of in the ICDF by the applicable WAC, contributes the entire allowable excess lifetime cancer risk of 1E-06 to the groundwater (a grossly conservative assumption), the proportion of risk contributed by the 0.55 kg of Aroclor 1260 is less than 1.4 E-12. The additional 0.55 kg of Aroclor 1260 resulting from this change in treatment plans is approximately 0.000145% (0.55 kg divided by 380,000 kg total allowable) of the landfill WAC maximum mass (DOE-ID 2004c).

In conclusion, if sparging of the waste to remove the volatile organic compounds is successful in meeting LDR treatment standards, no further treatment of the PCBs will be required. As a result approximately 0.55 kg of Aroclor will not be destroyed as a result of this change in treatment processes and will remain in the waste disposed of at ICDF. Based upon this evaluation, the changed remedy, including disposal of an additional 0.55 kg of untreated Aroclor-1260 at ICDF, does not pose a significant risk of injury to human health or the environment.

6.2 Overall Safety/Risk Management

At the heart of the INEEL's safety success is the Integrated Safety Management System (ISMS) that prescribes the procedures and processes necessary to do work safely at the INEEL. The Program Description Document (PDD)-1004, "INEEL Integrated Safety Management System" states:

> "The fundamental premise of the INEEL ISMS is to "Perform Work Safely." This is achieved by implementing formal processes that provide rigor and discipline to work execution. The ISMS protocol directs that all work be done safely through appropriate prescriptive work planning and execution. Planning and execution are driven by worker safety requirements that demand the necessary tools, training, procedures, equipment, and behaviors."

For cleanup of the V-Tanks contents using the revised remedy of VOC sparging, chemical oxidation/reduction as necessary, with stabilization, the V-Tanks have been categorized as a hazard category 2 facility. This category subjects the planned remediation activity to 10 CFR 830, Subpart B: Nuclear Safety Management, Safety Basis Requirements (10 CFR 830.207). Management Control Procedure (MCP)-2449, "Nuclear Safety Analysis," addresses requirements and guidance for updating and preparing safety basis documents for the V-Tanks to ensure the nuclear safety analysis activities are conducted in accordance with all laws, rules, and regulations. MCP-1176, "INEEL Safety Analysis

Process" addresses the requirements and provides guidance for the generation of safety analysis documentation.

As a Hazard Category 2 facility, the V-Tanks require a documented safety analysis (DSA). A DSA is a documented analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety. It is planned that a revision to the existing "Safety Analysis Report for the Test Area North Operations" (SAR 208), will address the operation of the V-Tanks cleanup project using VOC sparging, chemical oxidation/reduction as necessary, with stabilization.

The OU 1-10 Group 2 Remedial Design/Remedial Action Work Plan as well as the safety analysis will address the entire process for remediation of the tank contents. This process involves the following steps:

1. Consolidation of the V-Tanks waste into a single homogenous waste stream

2. Optional removal and treatment of excess water in the V-Tanks

3. Treatment using VOC sparging and chemical oxidation/reduction as necessary

4. Further treating the waste to achieve a stabilized, solid waste form

5. Sampling and analysis to confirm the treated waste meets LDR treatment requirements and ICDF WAC disposal limits

6. Packaging of the stabilized waste for disposal at ICDF.

Radiological evaluations and controls will include an As Low as Reasonably Achievable (ALARA) Review prepared by Radiological Engineering defining radiological hazards involved and proposed mitigations and work controls. These controls and others will be included in a job-specific radiation work permit along with any work control evaluation points and limiting conditions that will control changing or unplanned conditions as work progresses.

The INEEL has demonstrated several times that it can safely store and dispose of PCBs via the Agency-approved risk assessment application as follows:

1. *Application for the Risk-Based Storage of PCB Remediation Waste at the INEEL Radioactive Waste Management Complex (RWMC) TSA-RE* (INEEL 2001)

2. "INEEL CERCLA Disposal Facility Short Term Risk Assessment" (EDF-ER-327)

3. Letter dated June 19, 2002, from R. Albright, EPA Region 10, to D. Wessman, DOE-ID, "Risk-Based Approval under 40 CFR 761.61(c), 62(c), and 65(c)(9)(iv) Extension of Temporary Storage of PCBs from 30 days to 90 days at Decontamination, Deactivation, and Demolition (DD&D) Sites" (EPA 2002).

Transportation of the treated waste from TAN to ICDF is addressed by the INEEL Transportation Safety Document (PRD-310) and supplemented by a transportation plan for compliance with 10 CFR 830, Subpart B, "Safety Basis Requirements." Additionally, DOE Order 460.1B, "Packaging and

Transportation Safety," requires demonstration of equivalent safety to the U.S. Department of Transportation (DOT) Hazardous Materials Regulations.

Disposal of the treated waste in the ICDF is addressed by the *INEEL CERCLA Disposal Facility Complex Remedial Action Work Plan* (DOE-ID 2003) and the *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2004c). As described in Section 4, above, the ICDF is an engineered landfill that meets the substantive requirements of TSCA for PCB disposal in addition to DOE Order 435.1, RCRA Subtitle C (42 USC § 6921 et seq.), the Idaho Hazardous Waste Management Act of 1983 (Idaho Code § 39-4401). The ICDF will accept for disposal only hazardous, low-level, mixed low-level, and TSCA wastes generated from INEEL CERCLA activities. The ICDF Remedial Action Work Plan addresses not only the operations but also inspections, reporting and record-keeping, health and safety emergency response, and closure and post-closure requirements.

Compliance with ICDF WAC will ensure protection of human health and the environment, including the Snake River Plain Aquifer. Because the Snake River Plain Aquifer is located 450 feet below the ICDF, a system of multiple liners and liquid collection and diversion points is incorporated into the ICDF design to prevent contaminants from migrating below the bottom of the landfill and threatening the aquifer. The ICDF includes a comprehensive release-detection system, which will trigger prompt response actions. Thus, the overall ICDF system is protective of the environment.

ICDF WAC that potentially pertain to the treated V-Tanks waste are as follows:

- Waste containing greater than 10 nCi/g of transuranic radionuclides is prohibited from disposal at the ICDF in accordance with the *Final Record of Decision for Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13* (DOE-ID 1999).

- Soils classified as TSCA waste containing greater than 500 ppm of PCBs are prohibited from disposal at the ICDF in accordance with 40 CFR 761.60. PCB Remediation Waste (including the V-Tanks waste) does not have a concentration-based limit for disposal at ICDF.

- Hazardous waste from outside the Waste Area Group 3 area of contamination (AOC) must be treated to meet LDR requirements for 40 CFR 268 including universal treatment standard (UTS) limits, as applicable.

7. CONCLUSION

The ARAR 40 CFR 761.61(c) provides for the sampling, cleanup, treatment, and disposal of PCB remediation waste in a manner other than as described in 761.61(a) or (b) provided EPA finds that the method will not pose unreasonable risk of injury to health or the environment. EPA's evaluation of this method considers the planned treatment for the V-Tanks waste as well as the final disposition of the treated waste at the ICDF. This EDF contains documentation of the requirement to demonstrate no unreasonable risk. This document will be placed in the Administrative Record for OU 1-10. This document will be incorporated by reference into the V-Tanks ESD that is being developed concurrently. Signature by EPA of that ESD confirms the EPA finding of no unreasonable risk of injury to health or the environment under 761.61c. This approval is necessary for the operation of processes such as chemical oxidation/reduction that are capable of destroying the PCBs in liquid PCB Remediation Waste and for the conversion of liquid PCB Remediation Waste into solid PCB Remediation Waste.

8. REFERENCES

10 CFR 830, 2002, "Nuclear Safety Management," *Code of Federal Regulations*, Office of the Federal Register, February 4, 2002.

10 CFR 830.207 et seq., 2002, "Nuclear Safety Management, Subpart B: Safety Basis Requirements," *Code of Federal Regulations*, Office of the Federal Register, February 4, 2002.

40 CFR 261.24, 2004, "Identification and Listings of Hazardous Waste: Toxicity Characteristic," *Code of Federal Regulations*, Office of the Federal Register October 12, 2004.

40 CFR 268, 2004, "Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, March 29, 2004.

40 CFR 761.1(b)(4)(iv), 2003, "Polychlorinated Biphenyls (PCBS) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: Applicability," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.3, 2003, "Polychlorinated Biphenyls (PCBS) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: Definitions," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.60, 2003, "Disposal Requirements," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.61, 2003, "PCB Remediation Waste," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.61(a), 2003, "Self-Implementing On-Site Cleanup and Disposal of PCB Remediation Waste," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.61(a)(5)(iii), 2003, "Polychlorinated Biphenyls (PCBS) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: PCB Remediation Waste," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.61(b), 2003, "Performance-Based Disposal," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.61(c), 2003, "Risk-Based Disposal Approval," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.62(c), 2003, "Disposal of PCB Bulk Product Waste: Risk-Based Disposal Approval," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

40 CFR 761.65(c)(9)(iv), 2003, "Storage for Disposal: Extension of Temporary Storage," *Code of Federal Regulations*, Office of the Federal Register, June 20, 2003.

63 FR 124, 1998, "Final Rule, 40 CFR Parts 750 and 761, Disposal of Polychlorinated Biphenyls (PCBs)," *Federal Register*, U.S. Environmental Protection Agency, pp 35384 et seq., June 29, 1998.

15 USC § 2601 et seq., 2003, "Control of Toxic Substances," *United States Code*, January 6, 2003.

42 USC § 6921 et seq., 2002, "Identification and Listing of Hazardous Waste" (also referred to as "RCRA Subtitle C"), *United States Code*, January 22, 2002.

DOE Order 435.1, 2001, "Radioactive Waste Management," Change 1, August 28, 2001.

DOE Order 460.1B, 2003, "Packaging and Transportation Safety," April 4, 2003.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Record No. 1088-06-120, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency Region 10, and Idaho Department of Health and Welfare, Rev. 0, December 9, 1991.

DOE-ID, 1999, *Final Record of Decision for Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13*, Idaho National Engineering and Environmental Laboratory, DOE/ID-10660, Rev. 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency Region 10; Idaho Department of Health and Welfare, Division of Environmental Quality, October 7, 1999.

DOE-ID, 2003, *INEEL CERCLA Disposal Facility Complex Remedial Action Work Plan*, DOE/ID-10984, Rev. 0, U.S. Department of Energy Idaho Operations Office, February 5, 2003.

DOE-ID, 2004a, *Record of Decision Amendment for the V-Tanks (TSF-09 and TSF-18) and Explanation of Significant Differences for the PM-2A Tanks (TSF-26) and TSF-06, Area 10, at Test Area North, Operable Unit 1-10*, DOE/ID-10682 Amend, Rev. 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Division of Environmental Quality, February 2004.

DOE-ID, 2004b, *Technology Evaluation Report for the V-Tanks, TSF-09/18, at Waste Area Group 1, Operable Unit 1-10*, DOE/ID-11038, Rev. 1, U.S. Department of Energy Idaho Operations Office, March 10, 2004.

DOE-ID, 2004c, *Waste Acceptance Criteria for ICDF Landfill*, DOE/ID-10865, Rev. 7, U.S. Department of Energy Idaho Operations Office, August 2004.

DOE/NE-ID, 2004, *Explanation of Significant Differences for the Record of Decision for the Test Area North Operable Unit 1-10*, DOE/NE-ID-11199, Rev. 0, December 2004.

EDF-3868, 2003, "V-Tank Analytical Data – Calculated Averages and Upper Confidence Limits," Rev. 1, December 9, 2003.

EDF-4928, 2004, "Potential Feed Streams for Inclusion into V-Tank Treatment Process," Rev. 0, September 9, 2004.

EDF-ER-264, 2004, "INEEL CERCLA Disposal Facility Design Inventory," Rev. 2, June 18, 2004.

EDF-ER-274, 2004, "Leachate Contaminant Reduction Time Study," Rev. 2, August 26, 2004.

EDF-ER-327, 2004, "INEEL CERCLA Disposal Facility Short-Term Risk Assessment," Rev. 1, August 23, 2004.

EPA, 2002, Letter from R. Albright, EPA Region 10, to D. Wessman, DOE-ID, "Risk-Based Approval under 40 CFR 761.61(c), 62(c), and 65(c)(9)(iv) Extension of Temporary Storage of PCBs from 30 days to 90 days at Decontamination, Deactivation, and Demolition (DD&D) Sites," June 19, 2002.

Idaho Code § 39-4401 et seq., Hazardous Waste Management Act of 1983, State of Idaho Codes, 1983.

INEEL, 2001, *INEEL Application for the Risk-Based Storage of PCB Remediation Waste at the INEEL RWMC TSA-RE*, INEEL/EXT-99-00637, Rev. 2, Idaho National Engineering and Environmental Laboratory, March 27, 2001.

INEEL, 2003, *Conceptual Design Report for Ex Situ Chemical Oxidation/Reduction and Stabilization of the V-Tanks at Waste Area Group 1, Operable Unit 1-10*, INEEL/EXT-03-00438, Rev. 0, Idaho National Engineering and Environmental Laboratory, June 2003.

MCP-1176, 2004, "Safety Analysis Process," Rev. 1, June 6, 2004.

MCP-2449, 2002, "Nuclear Safety Analysis," Rev. 5, October 30, 2002.

PDD-1004 2004, "INEEL Integrated Safety Management System," Rev. 7, April 9, 2004.

PRD-310, 2004, "INEEL Transportation Safety Document," Rev. 6, August 23, 2004.

SAR-208, 2004," Safety Analysis Report for the Test Area North Operations," Rev. 2, October 4, 2004.