V# 10604 $1,000.00
TS

Idaho Treatment Group

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DEPARTMENT OF ENVIRONMENTAL QUALITY

April 17, 2013

C-2013-0124

Transmitting Electronically
william.rogers@deq.idaho.gov

Idaho Department of Environmental Quality
Attn: Bill Rogers, Stationary Source Permit Program Coordinator
Air Quality Division
1410 North Hilton
Boise, ID 83706

Subject: Transmittal of Permit to Construct Application for the Advanced Mixed Waste Treatment Project Transuranic Storage Area - Retrieval Enclosure – DN-035-13

Dear Mr. Rogers:

Enclosed are one hard copy and a compact disc containing the PDF version of the Permit to Construct (PTC) application for the Advanced Mixed Waste Treatment Project (AMWTP) Transuranic Storage Area - Retrieval Enclosure (TSA-RE). This PTC application addresses planned revisions to the Retrieval Contamination Enclosure (RCE) and Inner Contamination Enclosure (ICE), and proposes to add a Contamination Control Enclosure (CCE) to the TSA-RE. The AMWTP air emission inventory, modeling analysis, and regulatory review are also enclosed, as are the $1,000 application fee and required certifications.

ITG appreciates your attention and efforts on this project. If you have any questions or comments, please contact Chris Wernert, Air Monitoring Lead, at (208) 557-6783 or Carol Anderson, Environmental Compliance and Waste Services Manager, at (208) 557-6773.

Sincerely,
IDAHO TREATMENT GROUP, LLC

Danny Nichols
President and AMWTP Project Manager

CMW:vh

Enclosure

cc w/o enc: ***Transmitting Electronically***
Carol Anderson, ITG
Robert Boston, DOE-ID
Penny Bowers, DOE-ID
James Cooper, DOE-ID
Doug Greenwell, ITG
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Norm Sandlin, ITG
Chris Wernert, ITG
Fran Williams, ITG

cc w/enc: AMWTP Records Management

Air Quality **PERMIT TO CONSTRUCT** **State of Idaho** **Department of Environmental Quality**	**PERMIT NUMBER**	**CLASS**	**SIC**
	P-2011.0109	A	9511
	FACILITY ID	**AQCR**	**NAICS**
	023-00001	61	924110
	UTM ZONE	**UTM COORDINATES (km)**	
	12	335.3 Easting	4817.8 Northing

PERMITTEE			
U.S. Department of Energy and ~~Bechtel BWXT~~ Idaho *Treatment Group*, LLC (~~BBWI~~*ITG*)/AMWTP			
PROJECT			
PROJECT No. 60855 AMWTP Transuranic Storage Area – Retrieval Enclosure RCE/ICE *and TSA-R CCE*			
MAILING ADDRESS	**CITY**	**STATE**	**ZIP**
1955 Fremont Avenue 850 Energy Drive, Suite 200	Idaho Falls	ID	83415
FACILITY CONTACT	**TITLE**	**TELEPHONE**	
Teresa Perkins	Director, Environment and Sustainability Division	(208) 526-1483	
RESPONSIBLE OFFICIAL	**TITLE**	**TELEPHONE**	
Manager, Department of Energy- Idaho Operations Office President and General Manager, ~~Bechtel BWXT~~ Idaho *Treatment Group*, LLC *(ITG)*/AMWTP		(Obtain telephone numbers through facility contact if necessary)	
EXACT PLANT LOCATION		**COUNTY**	
INL / RWMC / Transuranic Storage Area		Butte	
GENERAL NATURE OF BUSINESS & KINDS OF PRODUCTS			
Waste Treatment			

PERMIT AUTHORITY

This permit is issued according to the Rules for the Control of Air Pollution in Idaho, IDAPA 58.01.01.200 through 228, and pertains only to emissions of air contaminants regulated by the state of Idaho and to the sources specifically allowed to be constructed or modified by this permit.

This permit (a) does not affect the title of the premises upon which the equipment is to be located; (b) does not release the permittee from any liability for any loss due to damage to person or property caused by, resulting from, or arising out of the design, installation, maintenance, or operation of the proposed equipment; (c) does not release the permittee from compliance with other applicable federal, state, tribal, or local laws, regulations, or ordinances; (d) in no manner implies or suggests that the Department of Environmental Quality (DEQ) or its officers, agents, or employees, assume any liability, directly or indirectly, for any loss due to damage to person or property caused by, resulting from, or arising out of design, installation, maintenance, or operation of the proposed equipment.

This permit will expire if construction has not begun within two years of its issue date or if construction is suspended for one year.

This permit has been granted on the basis of design information presented with its application. Changes in design, equipment or operations may be considered a modification. Modifications are subject to DEQ review in accordance with IDAPA 58.01.01.200 through 228 of the Rules for the Control of Air Pollution in Idaho.

KEN HANNA, PERMIT WRITER **MIKE SIMON, STATIONARY SOURCE MANAGER**	**DATE ISSUED**	~~SEPTEMBER 19, 2011~~*TBD*

PERMIT TO CONSTRUCT SCOPE

Purpose

1. This is a modification of the permit to construct (PTC) for the Transuranic Storage Area – Retrieval Enclosure (TSA-RE). The purpose of this PTC is to add *a soft-sided (or similar) Contamination Control Enclosure (CCE)* located within the TSA-~~RE for~~*RE for* waste retrieval and waste treatment operations. *The CCE will be in located in the TSA-R, and will be ~~refered~~referred to as the TSA-R CCE. The TSA-R CCE is an addition -to the already existing Retrieval Contamination Enclosure (RCE) and Inner Contamination Enclosure(s) (ICE) within the TSA-RE.*

2. Those permit conditions that have been modified or revised by this permitting action are identified by the permit issue date citation located directly under the permit condition and on the right hand margin.

3. This PTC replaces Permit to Construct No. P-*2011.0109*~~060512~~ issued on ~~August 29, 2006~~*September 19, 2011.*

4. The emission sources regulated by this permit are listed in the following table.

Table 1 REGULATED SOURCES

Source Descriptions	Emission Controls
Vehicle and Retrieval Operations inside the RCE/ICE *and the TSA-R CCE* at the TSA-RE; Includes but not limited to excavators, skid loaders, conveyors (if used), dump trucks and trailers	Reasonable control of fugitive dust (e.g., water or surfactant spray; shrouds; portable HEPA-filtered vacuums; access controls; use of radiological control areas; HEPA-filtered tents; operational, radiological and hazardous material control procedures; etc.)
TSA-RE Standby Generator, diesel-fired Caterpillar Model 3412, 500 kW output	Good combustion control
Propane-Fired Heaters (one unit rated at 150,000 Btu/hr & one unit rated at 75,000 Btu/hr)	Good combustion control
Propane-Fired Make-up Air Units (three units rated at 1.2 Million Btu/hr each)	Good combustion control

TSA-RE RCE/ICE

Process Description

5. Located on pad TSA 1 in the TSA-RE is an enclosure that surrounds the remaining waste that is left to be retrieved on Cells 1, 2, and 3. This enclosure, the Retrieval Contamination Enclosure (RCE), also contains an Inner Contamination Enclosure(s) (ICE) (or equivalent structure) that is used for the retrieval of severely degraded containers and/or treatment of wastes. *Additionally, the soft-sided (or similar) Contamination Control Enclosure (CCE) is used for the retrieval of severely degraded containers and/or the treatment of wastes.* The RCE, ~~/~~ICE *and TSA-R CCE are*~~is~~ used to store, characterize, and treat radioactive only waste and mixed waste. Wastes currently in storage at the AMWTP, as well as newly-generated on Site waste, may be moved to, stored, characterized, and treated in the RCE/ICE *and TSA-R CCE.*

6. Emission Controls Description

Table 2 TSA-RE RCE/ICE *and TSA-R CCE* DESCRIPTION

Emissions Units / Processes	Emission Control Devices	Emission Points
Vehicle and Retrieval Operations inside the RCE, /ICE *and TSA-R CCE* at the TSA-RE; Includes but not limited to excavators, skid loaders, conveyors (if used), dump trucks and trailers	Reasonable control of fugitive dust (e.g., water or surfactant spray; shrouds; portable HEPA-filtered vacuums; access controls; use of radiological control areas; HEPA-filtered tents; operational, radiological and hazardous material control procedures; etc.)	RCE/ICE *and TSA-R CCE* Stack
TSA-RE Standby Generator, diesel-fired Caterpillar Model 3412, 500 kW output	Good combustion control	Generator stack
Propane-Fired Heaters (one unit rated at 150,000 Btu/hr & one unit rated at 75,000 Btu/hr)	Good combustion control	Heater stacks
Propane-Fired Make-up Air Units (three units rated at 1.2 Million Btu/hr each)	Good combustion control	Heater stacks

Emission Limits

7. 40 CFR 61 Subpart H NESHAP Radionuclide Dose Impact Limit

Emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive, in any year, an effective dose equivalent of 10 millirem per year (mrem/yr) in accordance with 40 CFR 61.92.

[SEPTEMBER 19, 2011]

8. Criteria Pollutant Emission Limits

Nitrogen oxides (NO_x) emissions from the mobile equipment operating within the RCE/ICE *and TSA-R CCE* at the TSA-RE shall not exceed 33.4 tons per any consecutive 12-month period. The NO_x limit applies to equipment used to move soil and retrieve/treat waste within the RCE/ICE at the TSA-RE.

The NO_x limit does not apply to dump trucks, tugs, yard cranes, and other equipment that enters the RCE/ICE *and TSA-R CCE* at the TSA-RE to move soil, retrieved waste, or other materials from the RCE/ICE *and TSA-R CCE* to another location outside of the RCE/ICE *and TSA-R CCE*. This permit condition no longer applies after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE *and TSA-R CCE* has been completed.

[SEPTEMBER 19, 2011]

9. Opacity Limit

Emissions from any stack, vent, or functionally equivalent opening associated with the RCE/ICE *and TSA-R CCE* at the TSA-RE, shall not exceed 20% opacity for a period or periods aggregating more than three minutes in any 60-minute period in accordance with IDAPA 58.01.01.625. The permittee shall determine opacity by the procedures contained in IDAPA 58.01.01.625.

[SEPTEMBER 19, 2011]

10. In absence of any other credible evidence, compliance is assured by complying with permit operating, monitoring, and record keeping requirements.

[SEPTEMBER 19, 2011]

Operating Requirements

11. Limits for TSA-RE Waste Retrieval and Waste Treatment

- *Retrieval of breached containers and treatment of waste containers (liquid treatment, physical sizing and/or repackaging) of waste containers may be performed in any combination provided the Equivalent Emission Units (EEU) value calculated in accordance with **Equation 1** is less than 752 per day. One (1) EEU is equal to the emissions associated with retrieval of one (1) 55-gallon drum when the emissions are controlled using three (3) stages of HEPA filtration.*

  ***Equation 1**:*

  - *Definitions of incorporated variables (the number of containers shall be calculated in terms of 55-gallon drum equivalents [DE]):*
    - *number of breached containers (DE) retrieved in one day, **(br)***
    - *number of containers (DE) treated by repackaging and/or resizing in one day, **(re)***
    - *number of containers (DE) treated for liquids in one day, **(li)***
  - *The sum of retrieval and treatment involving two stages of HEPA filtration, **(2h)**:*
    - $2h = (3 \times [br + re]) + (4 \times li)$
  - *The sum of retrieval and treatment involving three stages of HEPA filtration, **(3h)**:*
    - $3h = (1 \times [br + re]) + (3 \times li)$
  - *Equivalent Emission Units, **(EEU)**:*
    - $EEU = 2h + 3h$

*11.1 Equation 1 shall not incorporate any variable for the number of breached containers retrieved **(br)** after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE and TSA-R CCE has been completed.*

~~11. Facility Waste Retrieval Limit~~

~~The following limits apply to the retrieval of waste from the RCE/ICE:~~

- ~~Any quantity of 55-gallon drum equivalents of waste that does not have a breach with waste constituents exposed may be retrieved each day.~~
- ~~In areas with at least two stages of HEPA filtration, no more than 23 55-gallon drum equivalents per day that are breached with wasted constituents exposed shall be retrieved.In areas with at least three stages of HEPA filtration, no more than 38 55-gallon drum equivalents per day that are breached with wasted constituents exposed shall be retrieved.~~
- ~~This permit condition no longer applies after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE has been completed.~~
- ~~The limit for waste retrieved, specified above for three stages of HEPA filtration, may be increased as long as an equivalent volume of waste is subtracted from the waste treatment limits specified in Permit Condition 12.~~

[State-Only Requirement, SEPTEMBER 19, 2011]

~~12. Facility Waste Treatment Limits~~

- ~~The permittee shall not treat more than 30 55-gallon drum equivalents of contact-handled waste through liquid absorption, liquid neutralization, or liquid decanting per day inside the RCE/ICE. In addition, the permittee shall not treat (physical sizing and repackaging) more than 40 55-gallon~~

~~drum equivalents of contact handled waste through repackaging/resizing per day inside the RCE/ICE. All treatment activities shall be performed in an area with a least three stages of HEPA filtration (e.g., ICE).~~

~~[State-Only Requirement, SEPTEMBER 19, 2011]~~

~~13~~*12.* Heater Fuel

The permittee shall combust propane exclusively in the RCE/ICE *and TSA-R CCE* heaters and make-up air units.

[SEPTEMBER 19, 2011]

~~14~~*13.* Standby Generator Hours of Operation

The maximum annual hours of operation of the standby generator shall not exceed 500 hours per any consecutive 12-month period.

~~15~~*14.* Standby Generator Fuel Consumption

The maximum hourly fuel consumption of the standby generator shall not exceed 40 gallons hours per hour.

~~16~~*15.* RCE/ICE *and TSA-R CCE* HEPA Filter System

When waste is being retrieved or treated in the RCE/~~-or~~ ICE *or TSA-R CCE*, the permittee shall operate and maintain *each associated*~~a~~ HEPA filter system~~-to filter exhaust from the RCE/ICE~~ ~~*or TSA-R CCE*~~ ~~stack prior to release to the atmosphere,~~ according to the requirements specified below:

~~16~~*15*.1 Each HEPA filter shall have a minimum particle removal efficiency of no less than 99.97%.

~~16~~*15*.2 The permittee shall maintain and operate instrumentation to measure the pressure drop across the filter(s). HEPA filter efficiency shall be tested according to the ASME N510 and/or N511 testing standard(s). Records of any testing performed shall be maintained in accordance with the General Provisions of this permit.

~~16~~*15*.3 The permittee shall maintain written documentation to ensure compliance with this permit. This shall include, at a minimum, written procedures that specify how the pressure drop across the filter will be measured, the frequency of pressure drop monitoring, and the conditions that require change-out of the filters.

16. *RCE/ICE and TSA-R CCE Ventilation System*

The permittee shall maintain the RCE/ICE ventilation system operation while TSA-R CCE operations are occurring. If the RCE/ICE ventilation system is not operating, the TSA-R CCE shall not be in operation.

[State-Only Requirement, SEPTEMBER 19, 2011]

Monitoring and Recordkeeping Requirements

17. Waste Retrieval Throughput Monitoring

The permittee shall monitor and record the following on a daily basis to demonstrate compliance with the corresponding operating limits:

- *Breached* drum equivalents retrieved per day in areas with at least two stages of HEPA filtration inside the RCE/ICE *or TSA-R CCE;*
- *Breached drum equivalents retrieved per day in areas with at least three stages of HEPA filtration inside the RCE/ICE or TSA-R CCE;*
- This permit condition no longer applies after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE *and TSA-R CCE* has been completed.

[State-Only Requirement, SEPTEMBER 19, 2011]

18. Waste Treatment Throughput Monitoring

The permittee shall monitor and record the following on a daily basis to demonstrate compliance with the corresponding operating limits:

- drum equivalents of contact-handled waste treated through liquid absorption, liquid neutralization, or liquid decanting per day inside the RCE/ICE *or TSA-R CCE, accounting individually for those treated in areas with 2 stages of HEPA filtration and for those treated in areas with 3 stages of HEPA filtration*;
- drum equivalents of contact handled waste treated through repackaging/resizing per day inside the RCE/ICE *or TSA-R CCE, accounting individually for those treated in areas with 2 stages of HEPA filtration and for those treated in areas with 3 stages of HEPA filtration.*

[State-Only Requirement, SEPTEMBER 19, 2011]

19. Equipment Hours of Operation

The permittee shall monitor and record on a monthly basis the hours of operation for each piece of equipment that operates inside the RCE/ICE *or TSA-R CCE* of the TSA-RE.

This permit condition does not apply to dump trucks, tugs, yard cranes, and other equipment that enters the RCE/ICE *or TSA-R CCE* at the TSA-RE to move soil, retrieved waste, or other materials from the RCE/ICE *or TSA-R CCE* to another location outside of the RCE/ICE *or TSA-R CCE*. This permit condition no longer applies after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE has been completed.

[SEPTEMBER 19, 2011]

20. 40 CFR 61 Subpart H NESHAP Radionuclide Monitoring

20.1 In accordance with 40 CFR 61.93, the permittee shall have in place, calibrated, and operating, an in-stack continuous emission monitoring system (CEMS) for the measurement of radionuclides from the RCE/ICE *or TSA-R CCE* exhaust stack.

20.2 In accordance with 40 CFR 61.93, the permittee shall determine radionuclide emissions and calculate effective dose equivalent values to members of the public using EPA-approved methods.

[SEPTEMBER 19, 2011]

21. NOx Emissions Calculations

The permittee shall calculate NOx emissions from the TSA-RE per consecutive 12-month period in the following manner:

21.1. On a monthly basis, for each piece of equipment operated within the TSA-RE as discussed in Permit Condition 8, the permittee shall multiply the hours of operation recorded in accordance with Permit Condition 19 by the horsepower rating for the equipment.

21.2. The permittee shall multiply the total from Permit Condition 21.1 by the appropriate emission factor. The emission factor to be used is 0.031 pounds NOx per horsepower-hour or a DEQ-approved alternative.

21.3 The permittee shall sum the NOx emissions from the previous consecutive 12-months.

21.4 This permit condition does not apply to dump trucks, tugs, yard cranes, and other equipment that enters the RCE/ICE *or TSA-R CCE* at the TSA-RE to move soil, retrieved waste, or other materials from the RCE/ICE to another location outside of the RCE/ICE *or TSA-R CCE.*

21.5 This permit condition no longer applies after retrieval of the existing waste containers, and the soil covering those waste containers, within the RCE/ICE *and TSA-R CCE* has been completed.

[SEPTEMBER 19, 2011]

22. Standby Generator Hours of Operation

Each month, the permittee shall monitor and record the hours of operation of the standby generator for that month and for the most recent 12-month period.

23. Standby Generator Fuel Monitoring

The permittee shall maintain documentation which demonstrates the standby generator does not exceed the 40 gallons per hour combustion rate limit. Documentation may consist of manufacturer performance specifications.

24. HEPA Filter Pressure Drop Monitoring

When RCE/ICE *or TSA-R CCE* is operating, the permittee shall monitor and record the pressure drop across the HEPA filter stages of the HEPA filter system at least once per day according to written procedures.

[State-Only Requirement, SEPTEMBER 19, 2011]

Reporting Requirements

25. 40 CFR 61 Subpart H NESHAP Annual Report

The permittee shall submit annual reports and maintain records documenting radionuclide emissions and effective dose equivalent values in accordance with 40 CFR 61.94 and 40 CFR 61.95.

[SEPTEMBER 19, 2011]

PERMIT TO CONSTRUCT GENERAL PROVISIONS

General Compliance

25. The permittee has a continuing duty to comply with all terms and conditions of this permit. All emissions authorized herein shall be consistent with the terms and conditions of this permit and the Rules for the Control of Air Pollution in Idaho. The emissions of any pollutant in excess of the limitations specified herein, or noncompliance with any other condition or limitation contained in this permit, shall constitute a violation of this permit and the Rules for the Control of Air Pollution in Idaho, and the Environmental Protection and Health Act, Idaho Code §39-101, et seq.

[Idaho Code §39-101, et seq.]

26. The permittee shall at all times (except as provided in the Rules for the Control of Air Pollution in Idaho) maintain in good working order and operate as efficiently as practicable, all treatment or control facilities or systems installed or used to achieve compliance with the terms and conditions of this permit and other applicable Idaho laws for the control of air pollution.

[IDAPA 58.01.01.211, 5/1/94]

27. Nothing in this permit is intended to relieve or exempt the permittee from the responsibility to comply with all applicable local, state, or federal statutes, rules and regulations.

[IDAPA 58.01.01.212.01, 5/1/94]

Inspection and Entry

28. Upon presentation of credentials, the permittee shall allow DEQ or an authorized representative of DEQ to do the following:

- Enter upon the permittee's premises where an emissions source is located or emissions related activity is conducted, or where records are kept under conditions of this permit;
- Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;
- Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit; and
- As authorized by the Idaho Environmental Protection and Health Act, sample or monitor, at reasonable times, substances or parameters for the purpose of determining or ensuring compliance with this permit or applicable requirements.

[Idaho Code §39-108]

Construction and Operation Notification

29. The permittee shall furnish DEQ written notifications as follows in accordance with IDAPA 58.01.01.211:

- A notification of the date of initiation of construction, within five working days after occurrence; except in the case where pre-permit construction approval has been granted then notification shall be made within five working days after occurrence or within five working days after permit issuance whichever is later;
- A notification of the date of any suspension of construction, if such suspension lasts for one year or more;
- A notification of the anticipated date of initial start-up of the stationary source or facility not more than sixty days or less than thirty days prior to such date; and
- A notification of the actual date of initial start-up of the stationary source or facility within fifteen days after such date.

[IDAPA 58.01.01.211, 5/1/94]

Performance Testing

30. If performance testing (air emissions source test) is required by this permit, the permittee shall provide notice of intent to test to DEQ at least 15 days prior to the scheduled test date or shorter time period as approved by DEQ. DEQ, at its option, may have an observer present at any emissions tests conducted on a source. DEQ requests that such testing not be performed on weekends or state holidays.

31. All performance testing shall be conducted in accordance with the procedures in IDAPA 58.01.01.157. Without prior DEQ approval, any alternative testing is conducted solely at the permittee's risk. If the permittee fails to obtain prior written approval by DEQ for any testing deviations, DEQ may determine that the testing does not satisfy the testing requirements. Therefore, at least 30 days prior to conducting any performance test, the permittee is encouraged to submit a performance test protocol to DEQ for approval. The written protocol shall include a description of the test method(s) to be used, an explanation of any or unusual circumstances regarding the proposed test, and the proposed test schedule for conducting and reporting the test.

32. Within 30 days following the date in which a performance test required by this permit is concluded, the permittee shall submit to DEQ a performance test report. The written report shall include a description of the process, identification of the test method(s) used, equipment used, all process operating data collected during the test period, and test results, as well as raw test data and associated documentation, including any approved test protocol.

[IDAPA 58.01.01.157, 4/5/00]

Monitoring and Recordkeeping

33. The permittee shall maintain sufficient records to ensure compliance with all of the terms and conditions of this permit. Records of monitoring information shall include, but not be limited to the following: (a) the date, place, and times of sampling or measurements; (b) the date analyses were performed; (c) the company or entity that performed the analyses; (d) the analytical techniques or methods used; (e) the results of such analyses; and (f) the operating conditions existing at the time of sampling or measurement. All monitoring records and support information shall be retained for a period of at least five years from the date of the monitoring sample, measurement, report, or application. Supporting information includes, but is not limited to, all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit. All records required to be maintained by this permit shall be made available in either hard copy or electronic format to DEQ representatives upon request.

[IDAPA 58.01.01.211, 5/1/94]

Excess Emissions

34. The permittee shall comply with the procedures and requirements of IDAPA 58.01.01.130-136 for excess emissions due to startup, shutdown, scheduled maintenance, safety measures, upsets and breakdowns.

[IDAPA 58.01.01.130-136, 4/5/00]

Certification

35. All documents submitted to DEQ, including, but not limited to, records, monitoring data, supporting information, requests for confidential treatment, testing reports, or compliance certification shall contain a certification by a responsible official. The certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

[IDAPA 58.01.01.123, 5/1/94]

False Statements

36. No person shall knowingly make any false statement, representation, or certification in any form, notice, or report required under this permit, or any applicable rule or order in force pursuant thereto.

[IDAPA 58.01.01.125, 3/23/98]

Tampering

37. No person shall knowingly render inaccurate any monitoring device or method required under this permit or any applicable rule or order in force pursuant thereto.

[IDAPA 58.01.01.126, 3/23/98]

Transferability

38. This permit is transferable in accordance with procedures listed in IDAPA 58.01.01.209.06.

[IDAPA 58.01.01.209.06, 4/11/06]

Severability

39. The provisions of this permit are severable, and if any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

[IDAPA 58.01.01.211, 5/1/94]

Advanced Mixed Waste Treatment Project

Application to Construct an Air Pollution Emitting Facility: The Transuranic Storage Area – Retrieval Enclosure

~~April 2011~~*April 2013*

TABLE OF CONTENTS

EXHIBITS

TABLES

APPENDICES

ACRONYMS and ABBREVIATIONS

αLLMW	alpha low-level mixed waste
$\mu g/m^3$	micrograms per cubic meter
AAC	acceptable ambient concentration
AACC	acceptable ambient carcinogenic concentration
acfm	actual cubic feet per minute
AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
ASME	American Society of Mechanical Engineers
CBD	ceramic/brick debris
CCE	*Contamination Control Enclosure*
CFR	Code of Federal Regulations
CO	carbon monoxide
DE	drum equivalents
DEQ	Idaho Department of Environmental Quality
DMS	data management system
DOE	*U.S.* Department of Energy
EBR-I	Experimental Breeder Reactor I
EDE	Effective Dose Equivalent
EPA	Environmental Protection Agency
FRP	fiberglass reinforced plywood
ft	feet
ft^2	square feet
FRP	fiber glass reinforced plywood
G	graphite
gal	gallon
gal/hr	gallons per hour
gr/dscf	grams per dry standard cubic foot
HD	heterogeneous debris
HEPA	high-efficiency particulate air

HVAC	heating, ventilation, and air conditioning
HWN	EPA hazardous waste number
ICE	Inner Contamination Enclosure
ID	inorganic debris
IDAPA	Idaho Administrative Procedures Act
IDC	item description code
IHS	inorganic homogeneous solids
in.	inch
INL	Idaho National Laboratory
IS	Interim Status
lb/hr	pounds per hour
m	meter
m^2	square meters
m^3	cubic meters
MD	metal debris
MW	mixed waste
NAAQS	National Ambient Air Quality Standards
NESHAP*s*	National Emission Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
OD	organic debris
OHS	organic homogeneous solids
PCB	polychlorinated biphenyl
PM	particulate matter
PRPR	paper/rags/plastic/rubber
RCE	Retrieval Contamination Enclosure
RCRA	Resource Conservation and Recovery Act
RE	removal efficiency
ROW	radioactive only waste
RWMC	Radioactive Waste Management Complex
SO_2	sulfur dioxide

TAP	toxic air pollutant
TRU	transuranic
TSA	Transuranic Storage Area
TSA-RE	Transuranic Storage Area - Retrieval Enclosure
U.S.	United States
VOC	volatile organic compound
WC	waste category
WMF	Waste Management Facility
wt%	percent by weight
yr	year

1.0 PROJECT DESCRIPTION

The Advanced Mixed Waste Treatment Project (AMWTP) Transuranic Storage Area (TSA)-Retrieval Enclosure (TSA-RE), commonly known as Waste Management Facility (WMF)-636, is located at the Radioactive Waste Management Complex (RWMC) on the Idaho National Laboratory (INL). The TSA-RE is operated by a designated contractor under contract with the United States (U.S.) Department of Energy-Idaho Operations Office (DOE-ID). Prior to the start of retrieval activities, the TSA-RE contained approximately 53,300 cubic meters (m^3) of the 65,000 m^3 of mixed waste (MW) to be processed at the AMWTP. As of ~~January 2011~~*August 2012*, there remains approximately ~~8,900~~*6,200* m^3 of waste *to be retrieved from*~~within~~ the TSA-RE.~~ that still requires retrieval.~~

The TSA-RE is a metal building that encloses three asphalt pads, which support primarily earthen-covered stacks of retrievably stored transuranic (TRU) and alpha-low level waste (αLLW).~~,~~ *The waste*~~ which~~ may be MW or radioactive only waste (ROW). *The* ~~Combined, there are~~ three asphalt pads, known as TSA-1, TSA-2, and TSA-R, *are* ~~(each of which is~~ divided into cells~~)~~. See Exhibit 1-1 for a diagram the TSA-RE showing the original floor plan of TSA-1, TSA-2, and TSA-R. Exhibits and tables cited herein refer to portions of the section in which they are cited and are located at the end of the cited section. Unless otherwise noted, sections referenced in this document refer to sections of this document.

The TSA-RE contains one *Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA)* *i*~~I~~nterim *s*~~S~~tatus (IS) Unit (i.e., TSA-1/TSA-R) and *one* ~~one Resource Conservation and Recovery Act (RCRA) P~~*p*ermitted ~~U~~*u*nit (i.e., TSA-2). Located on TSA-1 is ~~an enclosure~~*the Retrieval Contamination Enclosure (RCE), which*~~ that~~ surrounds the remaining waste that is left to be retrieved *from*~~on~~ Cells 1, 2, and 3. ~~This enclosure, the Retrieval Contamination Enclosure (RCE),~~ *The RCE* also contains an Inner Contamination Enclosure (ICE) (or ~~equivalent~~ *similar* structure)*, which may be used to provide additional controls when operationally advantageous. Located on TSA-R is a smaller soft-sided (or similar) contamination control enclosure referred to as the TSA-R CCE. Both the RCE/ICE and the TSA-R CCE may be*~~ that is~~ used for the retrieval of severely degraded containers and/or treatment of wastes. See Exhibit 1-2 for a diagram of the RCE/ICE *within TSA-1, and Exhibit 1-3 for a diagram of the TSA-R CCE* within ~~the~~ TSA-R~~E~~.

This application addresses only those activities conducted within the RCE*/ICE* and *TSA-R CCE* ~~ICE (or equivalent structure) on TSA-1/TSA-R of the TSA-RE. This application addresses equipment and other activities~~ (e.g., treatment of waste, container handling~~, etc.~~). ~~associated with the RCE and/ ICE *and TSA-R CCE.*~~ This application does not address activities (e.g., container storage) that occur ~~within the TSA-RE~~ outside ~~of~~ the RCE~~-and-~~/ICE *and TSA-R CCE,* as these activities are covered under an air exemption in accordance with IDAPA 58.01.01.220 through .223. The ~~state of~~ Idaho *Department of Environmental Quality (DEQ)* application forms~~/~~ *and* signature page ~~is~~ *are* included as Appendix A.

1.1 TSA-RE Configuration

Historically, the waste stacks within the TSA-RE appeared as either mounds of soil or tarp covered containers. The soil mounds were relatively flat across the top, and then sloped down on the sides. As of January ~~2011~~*2013*, a majority of the soil on top of the waste stacks has been removed and all containers from TSA-2 have been retrieved and placed into storage or disposed of at an off-site facility. The waste containers on TSA-1 consist primarily of 55-gallon (gal) drums and boxes, while the waste containers on TSA-R consist primarily of 55-gal drums, metal and fiberglass reinforced plywood (FRP) boxes, and metal bins. As of January ~~2011~~*2013*, only *drums within* cargo containers ~~loaded with drums requiring retrieval~~ remain *to be retrieved* on TSA-R ~~to be retrieved~~. Information provided on the original waste configuration of TSA-R is for informational purposes only.

During the initial storage of waste on TSA-1, waste drums were stacked horizontally with approximately nine drums high at the centerline of the pad and to a lesser height near the east/west edges of the pad. In addition, boxes were used to outline the sides of each cell on the asphalt pad. Beginning with Cell 5, the drums were stacked vertically. These containers were stacked about 16 ft high up to a point within about 30 ft of the asphalt pad east/west edges, where the stack height was limited to about 12 ft. Typically, a sheet of wood was placed between layers of vertical drums in order to stabilize the stacking surface and increase overall stack stability. As the TSA-1 pad was filled, the waste containers were covered with wood, a tarp or plastic sheeting, other miscellaneous materials, and 3 to 4 ft of soil on top with sloped side burden soils. Side burden soil was originally placed along the sides of each cell and between adjacent cells to act as a firebreak. Side burden soil averages around 16 ft thick to the top edge of the cells, although some areas have nearly vertical slopes held in place by wooden retaining walls. The soil in the area between the cells is about 4 ft thick. See Exhibit 1-~~3~~*4* for an example waste stack configuration.

TSA-R Cell 1 is a unique configuration that contained primarily cargo containers stacked two high that were loaded with 55-gal drums. Metal bins were stacked two high ~~from~~ *along* the perimeter of this cell. Also, Cell 1 is the only cell on TSA-R that was covered with wood, tarp, and soil; Cells 2 and 3 on TSA-R were covered only with plastic sheeting or a tarp.

The RCE/ICE ~~is~~ *and TSA-R CCE are* used to store, characterize, and treat ROW and MW. Wastes currently in storage at the AMWTP, as well as newly-generated on-Site waste, may be moved to, stored, characterized, and treated in the RCE/ICE *and the TSA-R CCE*. The RCE/ICE *and the TSA-R CCE* houses a number of activities, which include:

- Retrieval of containers with adequate integrity.
- Retrieval of containers that have deteriorated and/or breached integrity.
- Retrieval of containers/waste from ~~cargo~~ containers.
- Receiving and storing on-Site waste.
- Examining waste through visual means.
- Radiological surveying of containers.
- Soil removal activities including sampling and analysis.
- Removal of plastic, tarp, wood and other miscellaneous materials from the waste stack.
- Treating liquids in containers by the addition of absorbent.
- Decanting of liquids from containers.
- Neutralization of liquids in a container.
- Repackaging of waste from one container into another container(s).
- Repackaging of waste from a degraded container in the waste stack into another container(s).

- Sizing of waste such that the waste may meet size constraints for subsequent waste management activities.

1.1.1 Soil Removal

The retrieval process starts with the removal of overburden soil (i.e., the soil on top of the waste cells) in order to gain access to a given section of waste containers. Before removal, the soil is sampled for analysis of contaminants (e.g., organics, heavy metals, and radionuclides) and surveyed for radiological contamination. The majority of the soil is expected to be uncontaminated (estimated at 95% of the total volume of the overburden). Soil identified as uncontaminated is removed in two phases. Initially the bulk of the uncontaminated soil overburden is removed with equipment on top of the waste stacks. The equipment is used to transport soil from the top of the waste stack into a transport vehicle. Soil is managed appropriately, depending upon soil sample results. Dust suppression for soil removal activities is achieved by using water and/or a surfactant.

The final 6 to 12 inches (in.) of uncontaminated overburden soil, side burden soil, and interstitial soil may be removed using various equipment. Occasionally during soil removal operations, contaminated soil may be encountered. Contaminated soil may be removed and deposited into a container using dedicated soil vacuum systems (electrical only) or other equipment.

1.1.2 Removal of Plastic, Tarp, Wood, and Miscellaneous Materials

Once the overburden soil is removed, the plastic, tarp, and wood will be removed. In addition, miscellaneous materials (e.g., steel I-beams, rocks, and wooden joists) may also be encountered which require removal. Using handheld instruments, materials suspected of being contaminated will be surveyed. Uncontaminated materials will be stacked on pallets on top of the waste stack and then lowered (via equipment) to grade level or placed directly onto a transporting device (e.g., flatbed trailer). Radiologically-contaminated materials will be placed in appropriate containers for proper handling and disposal.

1.1.3 Waste Container Handling

After the soil, tarp, wood, and/or other miscellaneous materials are removed, a portion of the waste stack will be exposed. Waste containers will then be retrieved via a number of steps as follows:

Container Removal Operation Sequence:

- Survey the area from which the container is to be retrieved for radiation and then survey the container for radiological contamination.
- Assess the integrity of the container. Visually inspect the container before lifting it off the stack. Evaluate conditions such as corrosion of the container, stains on wood, etc. Repair or overpack damaged containers as necessary for removal.
  - ~~If the integrity of the container is severely degraded, then the waste from the container may be treated (e.g., repackaged) as described below in order to remove the container and its contents into a container with sufficient integrity.~~
  - ~~Containers that show significant deterioration (e.g., definitive container breaches, loss of container integrity through degradation and significant radiological contamination) will be operationally retrieved within the ICE or other equivalent containment structure in order to reduce impacts to human health and the environment.~~
- All external areas of a container that are suspected of being contaminated with radiological contamination may be painted in order to fix the contamination to the container. Containers with significant amounts of external radiological contamination may be overpacked.
- Lift the container a few inches to verify the integrity of the underside of the container.
- Remove the container from the waste stack.
- Inspect container for identification information.
- Apply appropriate labels and enter container identification information into the AMWTP Operating Record. If original labeling can be used to identify the container, query the existing waste storage database to identify the constituents in the waste container.

- Survey for radiological surface contamination and surface dose rate measurement. Perform rapid assay scanning, as applicable.

During the retrieval of containers, various treatment activities (i.e., absorption, decanting, neutralization, repackaging, and sizing) may be performed in order to reduce the need to treat the waste in another AMWTP waste management unit. In addition, containers may be transported to the RCE/ICE *or the TSA-R CCE* for the purpose of performing treatment.

~~All treatment activities shall be performed within the ICE or a designated area within the RCE that has equivalent ventilation (i.e., single stage HEPA prior to discharge into the RCE area). The ICE structure is a moveable containment structure within the RCE such that the ICE can be located within the RCE where needed for retrieval of containers with significant deterioration or for the treatment of containers.~~ *When it is advantageous to perform RCE operations with three stages of HEPA filtration, the ICE may be used to provide additional controls.* The ICE has a single-stage HEPA filter that draws air from within the ICE and vents into the RCE structure. *Refer to Section 2.5 for additional information about the ICE.*

If *treatment is performed in the RCE but without* ~~not performed within~~ the ICE, then the designated area for performing treatment operations shall be such that the area is divided into at least two separate sections. One section is used for providing a radiological buffer area between the outside of the RCE and the treatment area, and another section is used for performing the treatment operations. *The airlock attached to the TSA-R CCE provides a radiological buffer area between the treatment area and TSA-R exterior to the TSA-R CCE. Therefore, no additional buffer area is required for performing treatment operations in the TSA-R CCE.*

During retrieval activities, any further management (e.g., treatment, container repair) is based upon the visual examination of the container. Based upon the outcome of the visual examination, it may be desirable to repair the container integrity deficiencies (e.g., small breaches in container, structural defects, bulges, etc.) to the extent possible using various materials (e.g., adhesive tape, polyethylene patch with glue, wood, etc.) without overpacking the container.

1.1.4 Treatment of Waste

Various methods of treatment are performed in the RCE/ICE *and the TSA-R CCE*: absorption, decanting, and neutralization of liquids; the repackaging of waste; and the sizing of waste. The methods are performed individually and in conjunction with each other to treat waste in the most effective manner possible. Treatment operations typically include:

- Repackaging of waste from a container(s)/waste stack into another container(s).
- Physical sizing of waste such that the waste may meet size constraints for subsequent waste management activities.
- Decanting liquids into a container(s).
- Decanting liquids into a container(s) with absorbent.
- Adding absorbent to liquids.
- Neutralizing liquids in containers.
- Simultaneous absorption and neutralization of liquids by adding a neutralizing absorbent to liquids (either prior to or after the liquid is added).
- Decanting followed by neutralization and/or absorption.
- Co-mingling of compatible liquids prior to neutralization and/or absorption.
- Co-mingling of compatible absorbed liquids.
- Un-overpacking and/or repackaging of waste from cargo container(s) into other container(s).

The methods of treatment are summarized below. When more than one treatment is performed on a waste, the individual operations may be combined.

Absorption. The treatment objective of absorption is to select a suitable absorbent material to absorb any free liquid waste. Prior to absorption, the compatibility of the liquid with the absorbent being used is addressed.

Decanting. The treatment objective of decanting is to remove a sufficient volume of free liquid so that the free liquid remaining in the original container can be treated through the addition of absorbent, as described above, and/or to transfer the decanted liquid into another container. The primary method for decanting liquids is to use equipment (e.g., disposable pipettes, pumps, ladles, cups, drip pans, *vacuum from drain holes,* etc.) to transfer liquid into a container that is located in a liquid containment device. Efforts will be made to minimize the spread of MW contamination during waste transfer. The decanted liquid is typically absorbed after selecting a suitable absorbent material.

Neutralization. The treatment objective of neutralization is to adjust the pH of liquid waste to a desired range for absorption. The desired pH, which depends on the waste type and determines the specific absorption agent(s) to be used, is established prior to conducting treatment. Once neutralized, the liquid may be mixed with appropriate absorbents, unless the neutralizing agent is also an absorbent.

Repackaging and/or Sizing of Waste. The treatment objective of repackaging and sizing waste will vary upon the waste being managed. Repackaging does not include overpacking and un-overpacking activities. For example, typical objectives of repackaging/sizing include:

- Transferring the container from a container with poor integrity into another container with acceptable integrity.
- Transferring the contents from one container (e.g., box) into different container(s) in preparation for downstream processing (e.g., shipping, characterization, etc.).
- Transferring the contents of a single container into another container.
- Removing items prohibited from downstream AMWTP processes or items prohibited from disposal at the identified disposal facility.
- Physically reducing the size of waste such that the waste is acceptable for subsequent waste management activities.

1.1.5 Waste and/or Material Transport

Once a container has been retrieved and inspected and all appropriate/known information has been entered into the Operating Record, the container is then typically transported by conveyor or other container handling equipment to a loading area. No containers, materials, or equipment will be removed from the RCE*/ICE or the TSA-R CCE* until ~~it has~~*they have* been surveyed and determined to be *free of* radiological~~ly~~ *contamination* ~~uncontaminated~~ or until the contamination is fixed and/or contained.

1.1.6 Diesel Operated Machinery

During operations within the RCE/ICE *and TSA-R CCE* at the TSA-RE, several types of diesel-operated machinery will be utilized. The primary machines will be skid steer loaders (typically for soil removal operations) and telescopic boom forklifts (typically for waste container removal and handling operations). A yard crane and tugs will also be used for assistance in retrieval operations. Each diesel powered machine will be equipped with an in-line catalytic oxidizer/filter (these are not accounted for in the emission estimate calculations) for the purpose of reducing emissions from the combustion of the diesel fuel out the individual engine stacks. *A single small diesel forklift will be operated within the TSA-R CCE for handling containers within the enclosure.* The emissions from ~~the~~ diesel engines *operated within both* ~~will be exhausted from~~ the RCE/ICE *and the TSA-R CCE will be exhausted* via the ventilation system*(s)* out the RCE*/ICE* stack. These estimated emissions are included in the analysis in Section 4.0.

1.2 Location

The AMWTP TSA-RE is located at the RWMC on the INL. The RWMC is a restricted area of approximately 166 acres located in the southwestern corner of the INL. The TSA and the RWMC lie entirely within Butte County, Idaho. Exhibit 1-~~4~~*5* is a map of the INL that shows the location of the RWMC. A topographic map of the RWMC/AMWTP is provided in Appendix B.

Exhibit 1-~~5~~*6* shows the location of the TSA-RE with respect to other structures located at the RWMC. The TSA-RE is positioned on the western portion of the 56-acre TSA, west of the Advanced Mixed Waste Treatment Facility (AMWTF). The Type II storage modules, which ~~will~~ *are* ~~be~~ used for storage of the retrieved waste, are located ~~adjacent~~ to the east ~~side~~ of the AMWTF.

1.3 Schedule

Retrieval operations at the TSA-RE will normally take place during two 12--hr shifts per day, 330 days per year. However, to allow maximum operational flexibility, this permit application assumes that year-round continuous *(24-hrs per day, 365 days per year [8,760 hours per year])* operations occur *when determining* ~~, and~~ emission estimates for radionuclides and toxics. ~~are based on *24-hrs per day and 365 days per year*8,760 hours per year~~. The duration of retrieval operations within the RCE/ICE *and the TSA-R CCE* is expected to be between 1 and 2 years, given the optimal retrieval rate. Treatment operations within the RCE/ICE *and the TSA-R CCE* are planned for the duration of the AMWTP project, which is anticipated to continue through 2015. This date may be ~~extended~~ *delayed* if DOE-ID extends the AMWTP ~~project~~.

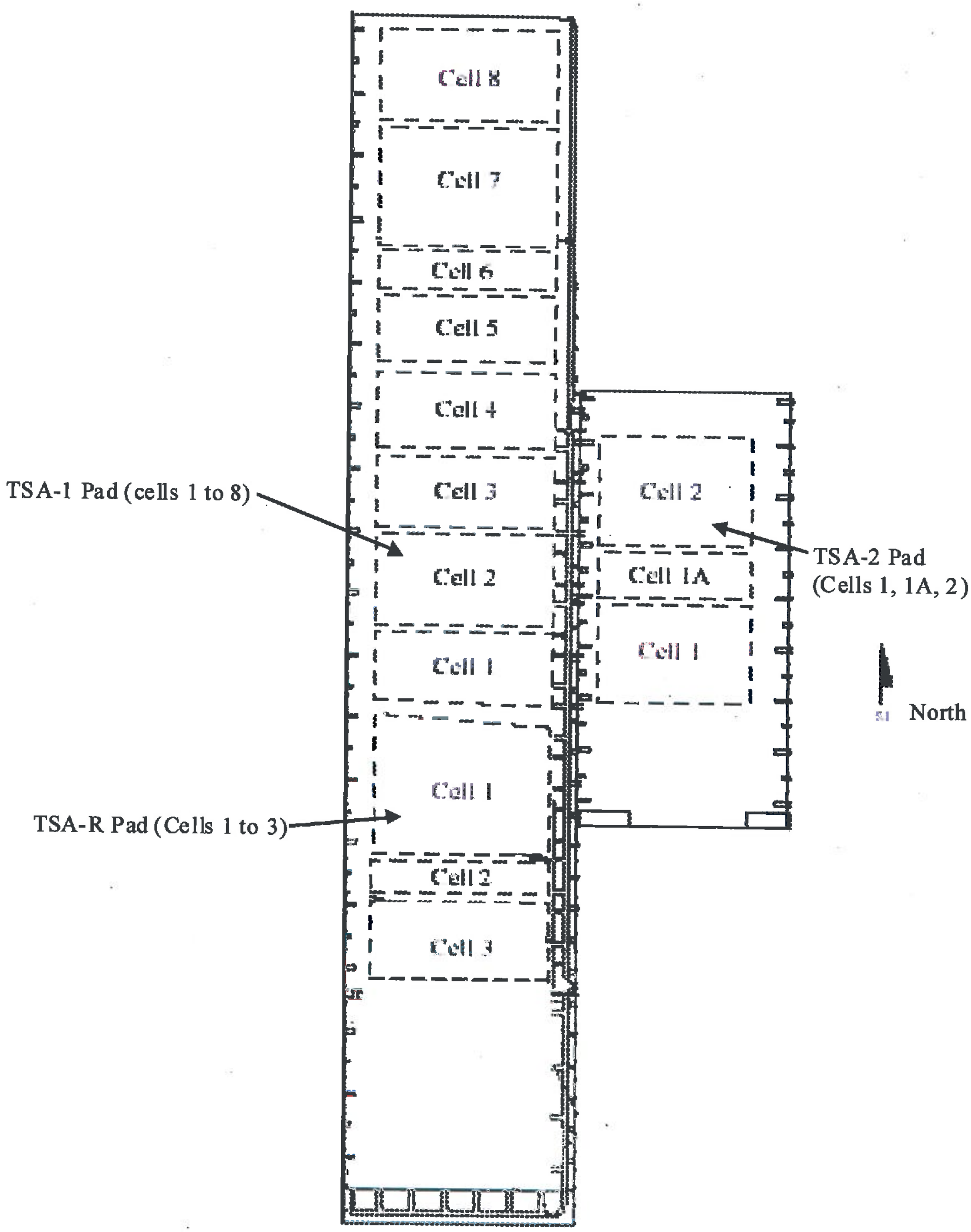

Exhibit 1-1. Original TSA-RE Floor Plan.

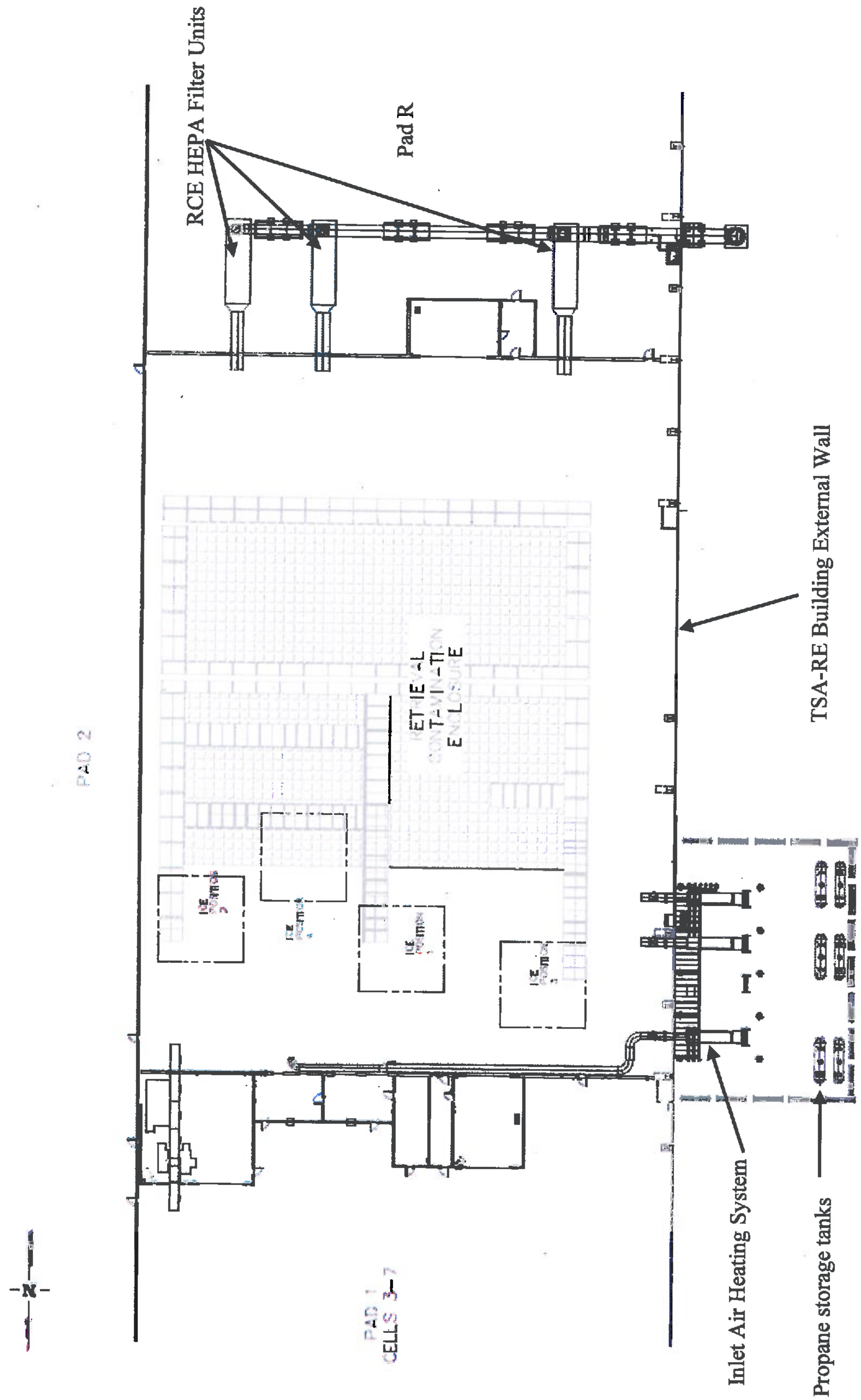

Exhibit 1-2. RCE/ICE Floor Plan

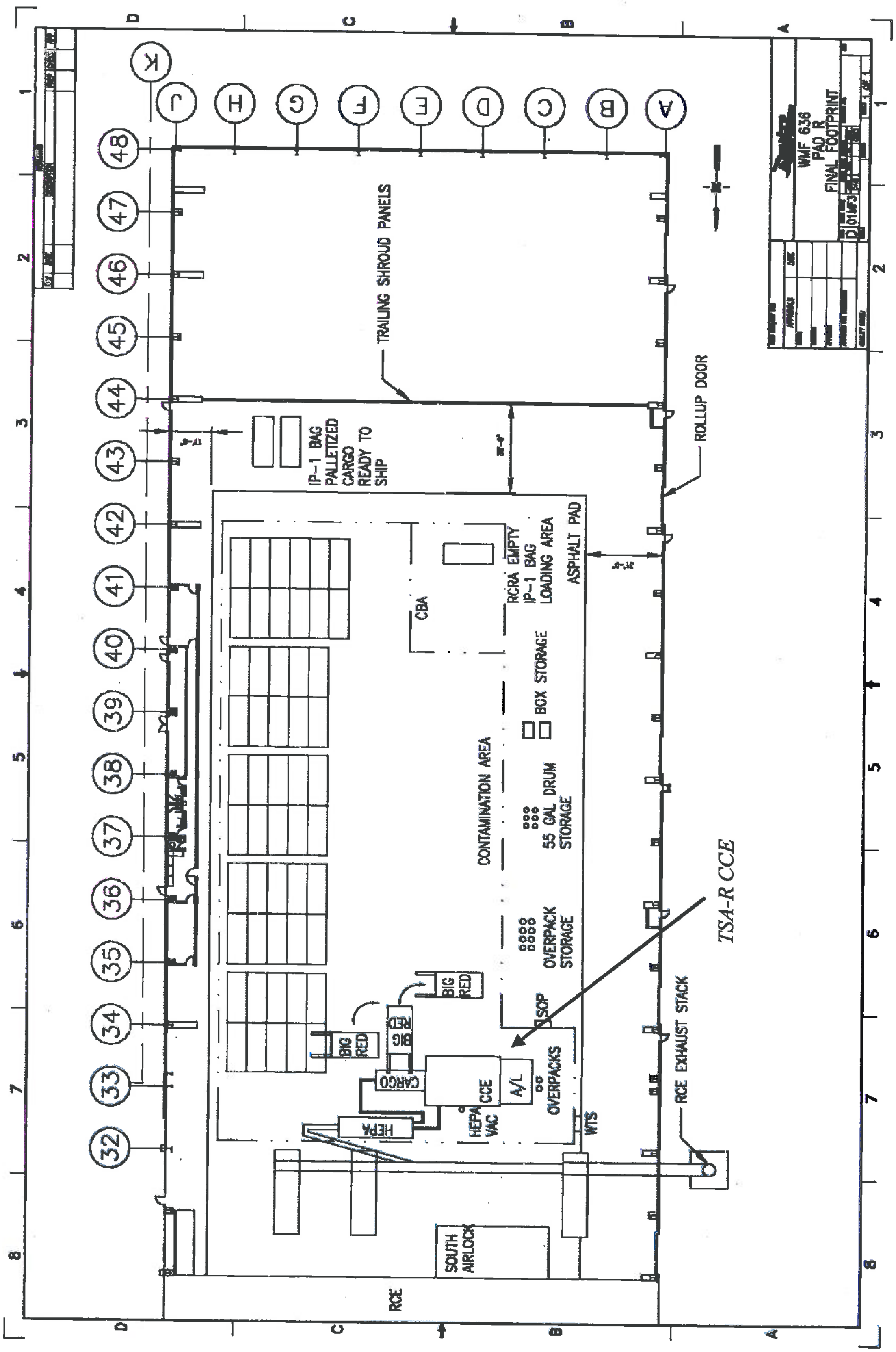

Exhibit 1-3. Location of CCE Within the TSA-R

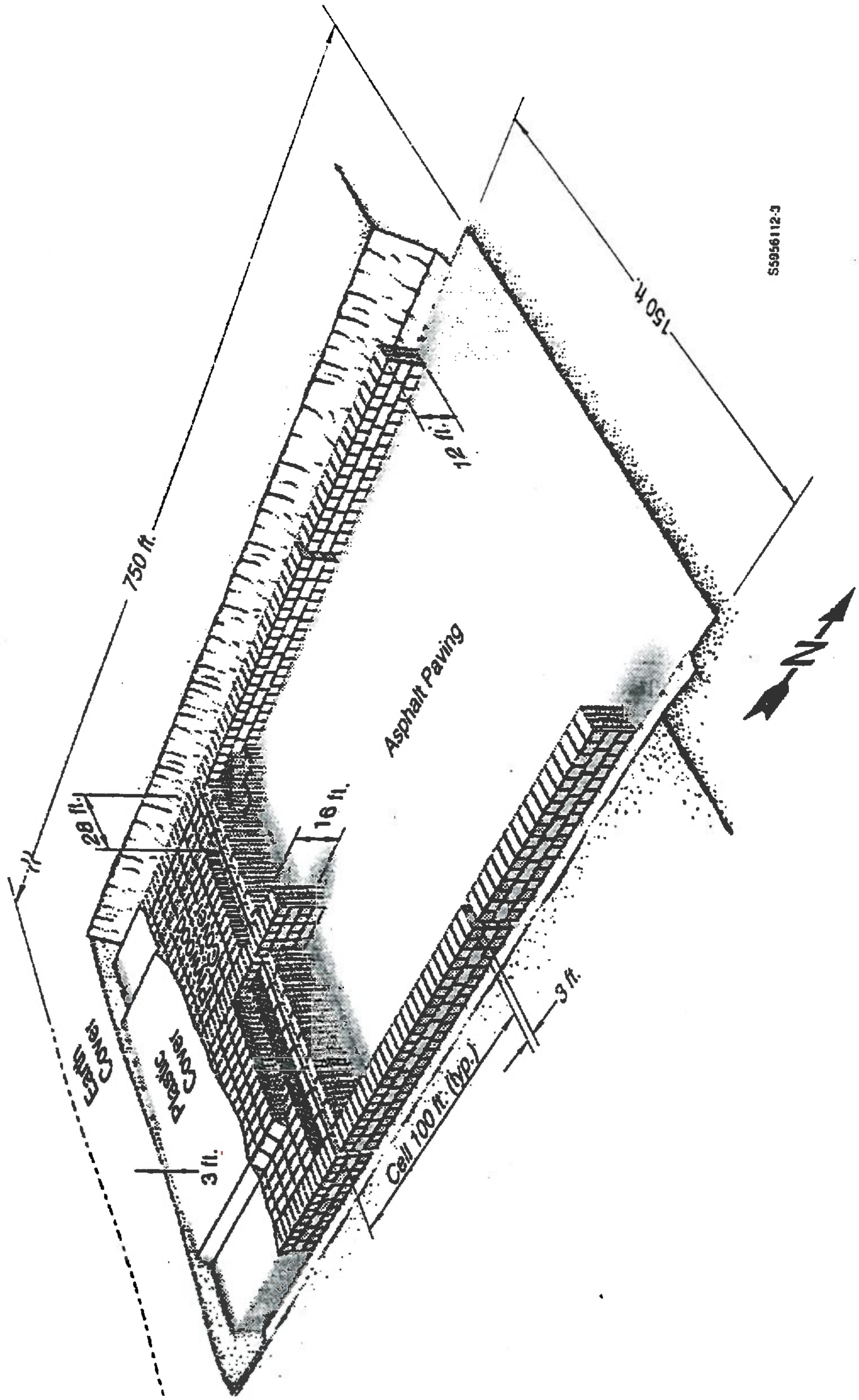

Exhibit 1-34. Example Waste Stack Configuration

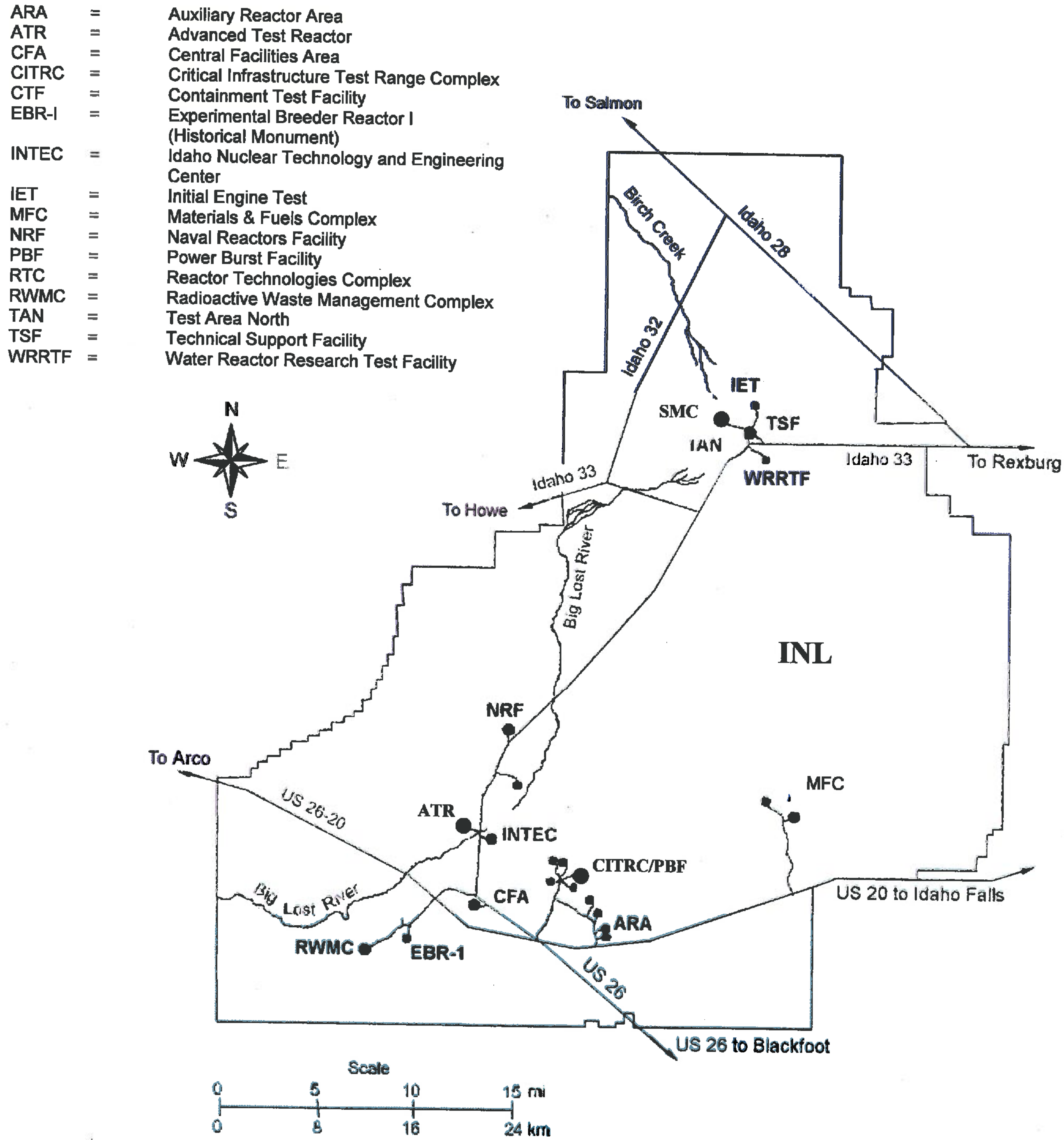

Exhibit 1-45. RWMC Location Map

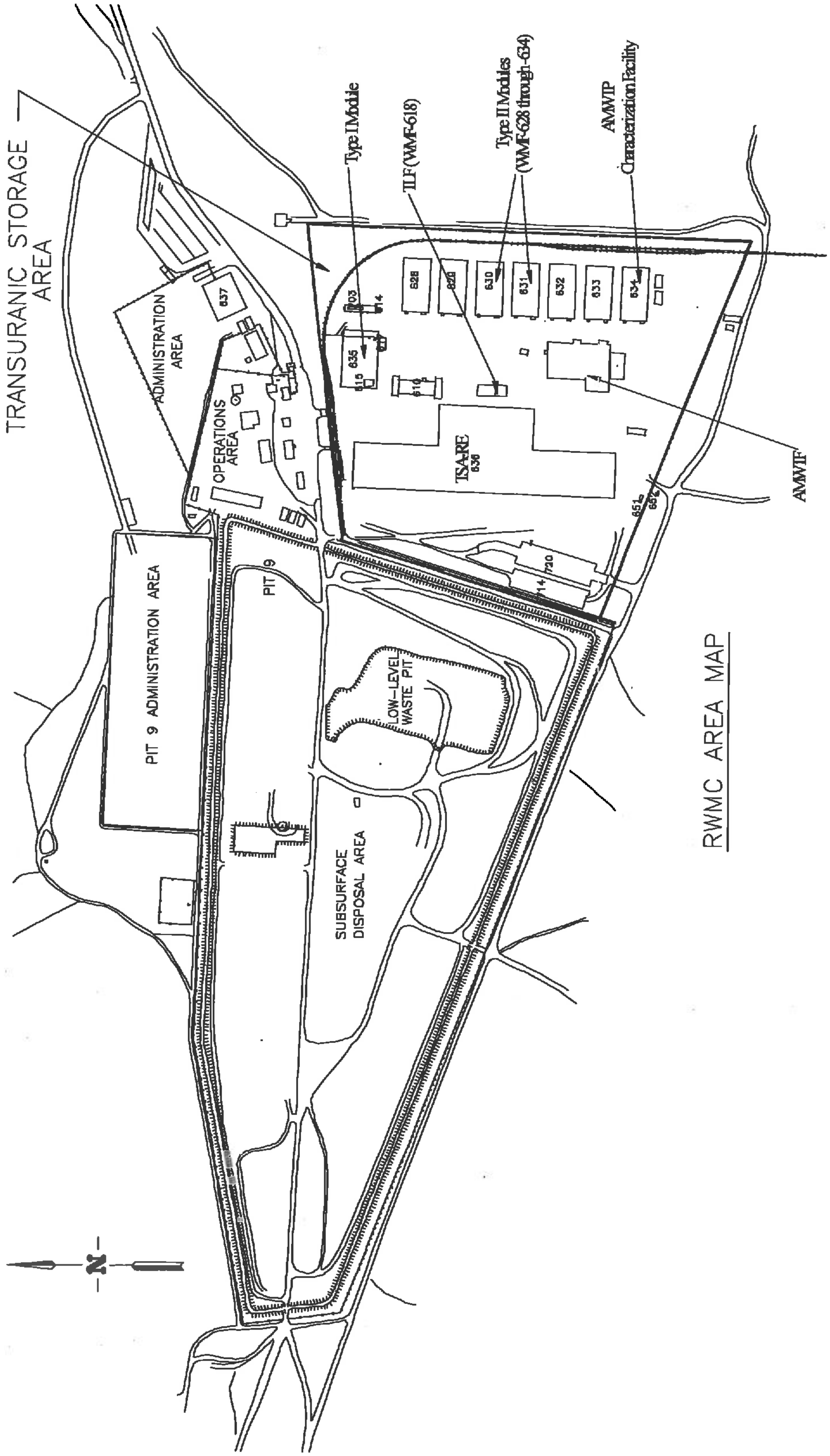

Exhibit 1-~~5~~6. Map of the RWMC

2.0 FACILITY DESCRIPTION

The TSA-RE is a "T"-shaped, engineered metal building with an area of about 313,000 square feet (ft^2). ~~As can be seen on Exhibit 1-1,~~ The TSA-RE encloses the TSA-1, TSA-2, and TSA-R *(refer back to Exhibit 1-1)*. The primary structure, which is oriented north-south, encloses TSA-1 and TSA-R and is approximately 200 ft wide by 1,180 ft long with an average eave height of approximately 35 ft. A secondary structure encloses TSA-2, which is approximately 185 ft wide by 430 ft long with an eave height of approximately 33.5 ft. More detailed information on the TSA-RE ~~building~~ is as follows.

2.1 Base

The TSA-1, TSA-2, and TSA-R pads are composed of a 2- to 4-in. thick asphalt surface on a compacted gravel base. Each pad slopes laterally towards the center-line across the width and longitudinally at a grade of approximately 1%. TSA-1 is sloped to the north, TSA-2 is sloped to the north and south, and TSA-R is sloped to the south. The slope helps prevent water from accumulating around the stored waste. The TSA-RE ~~building~~ is ~~located on~~*supported by* a continuous concrete beam foundation around the perimeter of the entire building.

2.2 Walls and Ceilings

The entire TSA-RE is constructed of metal siding and roofing installed over a steel frame. Insulation for the building is provided. A continuous sheet metal liner is affixed to the interior of the steel girts for the wall sections and to the underside of purlins that span between the bottom chords of the roof trusses for the ceilings. The structural steel columns are framed and enclosed with a sheet metal liner.

2.3 Doors and Entry Structure

Twelve overhead doors are installed in the primary enclosure; eleven spaced along the west wall, and one in the east wall near the north corner. Two overhead doors are installed in the structure enclosing TSA-2, one in the east wall, and one in the south wall. One portable entry structure is available and is designed to connect to the TSA-RE ~~building~~, enclosing the overhead door and personnel access door nearest the active work area during retrieval operations. Eleven personnel access doors are located along the west wall of the primary enclosure, while seven personnel access doors are located along the east wall.

2.4 RCE Structure

The RCE structure consists of three large tensioned-fabric walls *(or similar)* and modular steel walls with airlocks and other supporting rooms. The three fabric walls are located on the north, west, and south sides of the RCE. The fabric is suspended and tensioned through the use of structural steel. The east wall is a modular steel wall that separates the TSA-1 ~~Unit~~ *from*~~and~~ TSA-2 ~~Unit~~. The north and south walls extend from the asphalt surface of ~~the~~ TSA-1 ~~Unit~~ to the ceiling of the TSA-RE ~~building~~ and are a combination of fabric and modular steel walls. The modular steel walls are used for the airlock, personnel areas, and the partition between ~~the~~ TSA-1 ~~Unit~~ and TSA-2 ~~Unit~~ to the upper wall partition in order to isolate the RCE from TSA-2. Support rooms include equipment/personnel airlocks, a control room, operations support room(s) (e.g., radiological control, industrial health, industrial safety) and waste export airlocks. *Refer back to* ~~See~~ Exhibit 1-2 for additional information.

2.5 ICE Structure

Within the RCE, a mobile soft-sided contamination control system *(or similar),* known as *an* ~~the~~ ICE, is used for the control of contamination during treatment ~~activities~~ and*/or* ~~during~~ retrieval ~~of significantly degraded containers~~ *when a third stage of HEPA filtration is desired for RCE operations*. The ICE is a mobile system such that the ICE can be moved to a specific location within the RCE. *Refer back to* ~~See~~ Exhibit 1-2 for an example of the location within the RCE.

2.6 TSA-R CCE Structure

The TSA-R CCE is a soft-sided (or similar) enclosure located on TSA-R, between column lines 32-34. The TSA-R CCE is used for the control of contamination during the treatment and/or retrieval using three stages of HEPA filtration. Refer back to Exhibit 1-3 for the location of the

TSA-R CCE.

2.~~6~~*7* Utilities

Utilities for the TSA-RE structure including the RCE/ICE *and the TSA-R CCE* include an electrical distribution; standby power; propane heating; lighting; instrument air; emergency notifications; heating, ventilation, and air conditioning (HVAC); breathing air units; potable water; and sewer systems.

2.~~7~~*8* Heating System

No general space heating is provided for the TSA-RE as a whole. Special purpose rooms that are routinely occupied by personnel, and/or rooms that house equipment that must be freeze protected are provided with locally mounted and controlled space heaters. The RCE structure is provided with a limited heating system for freeze protection.

2.~~8~~*9* Ventilation System

An extensive ventilation system was originally installed for the TSA-RE ~~building~~ as a whole, but it is of limited capacity. As described earlier, this document does not address operations (e.g., container storage) outside of RCE/ICE *and TSA-R CCE* operations, and the equipment/activities associated with the RCE/ICE *and the TSA-R CCE.* The ventilation system for the TSA-RE ~~building~~ covers the areas outside of the RCE/ICE *and TSA-R CCE,* and exhausts to a stack located on the east side of the TSA-RE ~~building~~.

A ventilation system specifically for the RCE/ICE *(which also supports the TSA-R CCE)* is utilized for ~~retrieval~~ *operational* activities within these units. Air handling units feed outside air into the RCE. The inlet air is heated for freeze protection of the RCE/ICE and to provide minimal heat for personnel comfort. Air from the operating area of the RCE is filtered by dual-stage high efficiency particulate air (HEPA) filters, which vent to a stack located on the west side of the TSA-RE ~~building~~. See Exhibit 1-2 for additional information.

The ICE (or ~~equivalent~~*similar* structure) is filtered by a single-stage HEPA filter, which vents directly into the RCE. *The TSA-R CCE is filtered independently of the RCE/ICE through three* *stages of HEPA filtration, which discharge into the primary duct of the RCE/ICE stack. The RCE/ICE ventilation must be fully operating in order for activities to occur within the TSA-R CCE.*

3.0 VENTILATION SYSTEM

The *RCE/ICE and TSA-R CCE* ventilation system will be used to vent equipment combustion gases, and fugitive *volatile organic compound (*VOC*)* emissions *and radionuclide emissions*. For purposes of air dispersion modeling, the design discharge velocity of the exhaust is assumed to be approximately ~~24,550~~*36,260* actual cubic feet per minute (acfm) and the height of the main stack is assumed to be approximately 60 ft above the finished floor height with a discharge diameter of 5 ft. The operational design temperature of the stack exhaust is between 40 degrees Fahrenheit (°F) and 90 °F.

3.1 Ventilation Systems

The emission sources from the RCE/ICE *and the TSA-R CCE may* ~~will likely~~ include exhaust from the equipment (e.g., telescopic boom forklifts, skid steer loaders, yard cranes, and tugs) and fugitive VOC emissions from breached containers potentially encountered during retrieval operations.

Ventilation for operations within the RCE/ICE ~~will~~ occur*s* via an exhaust system. As described in Section 2.*9*~~8~~, air from the RCE is filtered by dual-stage HEPA filters, which are located on the south side of the RCE. The HEPA filtration system for the RCE is not located within the RCE in order to minimize contamination of the equipment. *Refer back to* ~~See~~ Exhibit 1-2 for the location of the RCE HEPA filtration units. The RCE filtration system consists of three separate exhaust units, all of which have dual-stage HEPA filtration capabilities. Under normal operating conditions, two of the exhaust units *are*~~will be~~ utilized. The third exhaust unit is provided for backup in the event that one of the other exhaust units *is* ~~has to be~~ taken out of service. All RCE HEPA filter systems exhaust through the RCE/ICE stack.

Ventilation for the mobile ICE system (or ~~equivalent~~*similar* structure) is filtered by a single-stage HEPA exhaust system. This exhaust system is portable, as the ICE is a mobile system, and the system vents directly into the RCE operating area. ~~,~~

Portable ventilation units serve the TSA-R CCE. They are rated at up to 6,000 CFM and have 3-stages of HEPA filtration. Any airflow out of the enclosure is filtered to remove particulate *matter (PM) prior to discharge into the RCE ventilation duct. This connection occurs upstream of at least one point of discharge for the RCE mechanical system to ensure adequate mixing of the effluent. The TSA-R CCE portable ventilation units are equipped with ventilation discharge dampers, which close automatically when the unit is not in operation. This prevents backflow of RCE exhaust into the portable units.*

3.2 Emission Monitoring System

Sampling/Monitoring. Sampling port location(s) for the RCE/ICE stack are located on the stack and are accessed from the outside of the TSA-RE ~~building~~ structure. The stack is designed to accommodate radionuclide monitoring in accordance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) requirements. See Appendix *C*~~D~~ for additional information.

HEPA Filter Monitoring. The efficiency of each HEPA filter or HEPA filter bank, as applicable, is routinely tested according to American Society of Mechanical Engineers (ASME) N510-2007, Section 9 standards.

Recordkeeping and Reporting. Measurements and data correspondence relating to sampling/monitoring systems, performance testing measurements, equipment calibration, and maintenance performed on equipment are ~~kept~~ *maintained* in accordance with the AMWTP quality assurance program. Radionuclide emissions are reported annually in the INL NESHAP*s* radionuclide reports in compliance with Title 40 Code of Federal Regulations (CFR) Part 61.94. Records documenting radionuclide emission input parameters, calculations, analytical methods, and the procedure used to determine the effective dose equivalent are maintained for 5 years (yrs), as required by 40 -CFR -61.95.

4.0 ESTIMATED EMISSIONS

The potential exists for emissions of radionuclides, metals, VOCs, and criteria pollutants during retrieval and treatment operations. Estimates of these emissions, except for radionuclides, are presented in this section. Radionuclide emissions are presented in the NESHAP analysis, included as Appendix C.

4.1 Waste Description

Both debris and non-debris wastes ~~will be~~*are* stored, retrieved, characterized, and treated within the RCE/ICE *and the TSA-R CCE*. The estimated concentrations (bounding estimates based on existing documentation plus assumptions) of hazardous pollutants in each waste stream that remains to be retrieved are based on the findings detailed in "Waste Description Information for Transuranic-Contaminated Wastes Stored at the *Idaho National Engineering Lab (*INEL*)*," (B.D. ~~Ravio~~ *Raivo* et al. 1995). The highest value for the estimated concentration of a particular pollutant in a waste type (debris or non-debris) is assigned to that pollutant. A concentration is then determined for all AMWTP waste by assigning the highest value of a particular pollutant between debris and non-debris waste. For example, of the various waste streams in the non-debris waste type, the highest estimated concentration for chloroform is 0.05% by weight. Therefore, for the non-debris waste type, a conservative concentration of 0.05 wt% is assigned to chloroform. Likewise, the highest estimated concentration of chloroform for the debris waste type is at 1 wt%. Therefore, a conservative concentration of 1 wt% is assigned to chloroform for all AMWTP waste. See Table 4-1 for the worst case waste concentrations used for AMWTP waste.

Where no concentration is given for an "estimated concentration" for a pollutant in the ~~Ravio~~ *Raivo* report, the "maximum expected" concentration stated in the ~~Ravio~~ *Raivo* report is used. All waste streams have been cross-referenced with "AMWTP Waste Stream Designations," (RPT-TRUW-12) which lists pollutants expected to be found in AMWTP waste streams. However, RPT-TRUW-12 does not provide concentrations of pollutants. Therefore, pollutants listed in RPT-TRUW-12 that are not listed in the ~~Ravio~~ *Raivo* report or provided with concentrations in the ~~Ravio~~ *Raivo* report are conservatively assigned a concentration of 1 wt%.

The waste remaining to be retrieved from the TSA-RE is listed in Table D-1 in Appendix D. Table D-1 lists the waste by generator name and item description code (IDC), which is a three-digit number assigned to each waste stream. The waste streams are presented according to the seven debris waste categories (WCs) and three non-debris WCs. The Environmental Protection Agency (EPA) hazardous waste numbers (HWNs), as presented in Table D-1, shown for each waste stream have been assigned based on a combination of acceptable process knowledge gathered from waste generators, waste generator supplied data, and results of headspace gas and waste sample analysis. These data sources and the basis for assigning the HWNs are described in References 2 and 3 (see Section 5).

4.2 Emission Sources

The RCE/ICE *and TSA-R CCE* are expected to have several emissions sources. The assumed emission sources range from the fugitive emissions from breached containers and treatment activities to exhaust emissions from diesel and propane-operated machinery. Table 4-2 lists expected sources of non-radioactive emissions from the RCE/ICE *and the TSA-R CCE.*

4.3 General Assumptions

Table 4-2 also indicates the types of hazardous or non-radioactive emissions expected from each emission source. The categories are described below.

Particulate matter. In general, processes that disturb the waste such as liquid treatment, breached container retrieval, cargo container retrieval, repackaging, sizing, and operations that disturb the soil are assumed to emit ~~particulate matter (~~PM~~)~~. Combustion processes (e.g., operation of the heater and engines) also contribute to PM emissions.

Volatile organic compounds. VOCs are accounted for in areas where processes disturb the waste, such as liquid treatment, breached container retrieval, cargo container retrieval, repackaging, sizing, and operations that disturb the soil.~~,~~ Fuel combustion processes will emit VOCs, as well. The semi-volatile and other non-volatile pollutants that are not emitted as PM included in the waste inventory are treated as VOCs. Since these compounds are less volatile than VOCs, the emission estimates for these semi-volatiles and other non-volatile pollutants are conservative.

Criteria pollutants. In addition to PM and VOCs, the criteria pollutants sulfur dioxide (SO_2), nitrous oxides (NO_X), and carbon monoxide (CO) will be emitted from sources using fuel combustion processes (e.g., diesel engines and propane heaters).

Toxic air pollutants (TAPs). The TAPs identified for the RCE/ICE *and the TSA-R CCE* are those constituents present in the waste streams that are identified as TAPs in Sections 585 and 586 of IDAPA 58.01.01.

Emission control equipment efficiencies. For processes filtered by emission control equipment, the equipment's rated efficiency was applied to the calculated values of pollutant emissions to determine controlled emission rates. See Appendix D for additional information.

4.4 Source Emissions Summary

Process emissions. To calculate emissions from process sources, total VOC and total PM emissions were first estimated for each potential source. Total PM estimates, excluding contribution from combustion equipment, are summarized in Table D-2 of Appendix D. Table D-3 of Appendix D summarizes the assumptions and factors used to calculate total "VOCs."

These calculations are based on the emission factors from applicable sections of the EPA publication AP-42, "Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources," (hereafter referred to as AP-42). If a good match was not identified in AP-42 for a process, a conservative emission factor was derived from process knowledge and best engineering judgment. For the VOC emissions, the AP-42 emission factor for solvent operations was applied. However, the AMWTP "solvents" are actually contained in a liquid (for example, lathe cutting oil), which has been stabilized with an absorbent, such as calcium silicate. For the estimate, the emission factors have been applied to the liquid fraction of the waste and quotation marks are used to indicate the loose interpretation of "VOC" emissions. Process experience has shown that debris waste, which often consists of pieces of material with high surface areas exposed to surrounding air, will retain a negligible amount of the original concentration of organic constituent.

Removal efficiencies for emission control equipment were applied to each source to determine the abated emission rates. HEPA filters are rated at a minimum removal efficiency of 99.97% for 0.15 to 0.3 micron particles, with an increased efficiency for larger and smaller particles.

A conservative removal efficiency of 99.9% was used in the nonradioactive emissions calculations, an order of magnitude less than the certified particulate removal efficiency.

From total VOCs and PM values, individual TAP emissions were determined by multiplying the worst-case concentration percentage of each constituent in the AMWTP waste by the total VOCs or PM emitted for that specific operation. The TAPs were separated into those that are likely to be emitted as "VOCs" and those likely to be emitted as PM. These emission estimates are presented in Table 4-3.

Heater emissions. ~~The~~ *Specifications for the* heaters associated with the RCE/ICE are provided in Table 4-4. Emissions from the heaters associated with the RCE/ICE were estimated as detailed in Tables 4-5 and 4-6. The maximum hourly rate was calculated assuming the heaters will operate at its rated input capacity for 1.0 hour. The yearly rate was based on continuous operation for 6 months (24 hr/d, 7 d/wk, and 26 wk/yr).

Three of the RCE/ICE propane heaters are rated at 1.2 million British thermal units (BTU) per hr each, one propane heater is rated at 0.15 million BTU/hr, and one propane heater is rated at 0.075 million BTU/hr. Because the heater capacities are below the 10 million BTU/hr level, the heaters are not required to comply with the standards for new sources per IDAPA 58.01.01.676. The requirement states that fuel burning equipment with a maximum rate input of 10 million BTU/hr or more shall not discharge PM in excess of 0.015 grains per dry standard cubic feet (gr/dscf), corrected to 3% oxygen.

Diesel engine emissions. Emissions from diesel-operated machinery were estimated as detailed in Tables 4-7 and 4-8. The significant emission threshold limits and the total emission estimates for the propane heater and the diesel powered machinery can be found in Table 4-9.

4.5 Air Dispersion Modeling

Refined air dispersion modeling was performed in accordance with the EPA and DEQ modeling guidelines to establish site-specific dispersion coefficients, based on a 1 pound (lb) per hour (hr) (lb/hr) emission rate, for potential RCE/ICE *and TSA-R CCE* releases of TAPs and criteria pollutants. See Section 5.0 for references to the applicable EPA and DEQ procedures and guidelines used. Appendix E contains the air dispersion modeling analysis details. The air dispersion modeling and analysis for radionuclide emissions *are*~~is~~ included in Appendix C.

4.6 Results Analysis

This section summarizes the results of the emission calculations for the RCE/ICE *and the TSA-R CCE,* and evaluates the results for compliance with the applicable portions of IDAPA 58.01.01. The subsections that follow specifically address modification status (major or "minor" modification per IDAPA 58.01.01.007, 58.01.01.006.104, and 58.01.01.203.01), emissions of TAPs (IDAPA 58.01.01.203.03 and 58.01.01.210), and comparison to National Ambient Air Quality Standards (NAAQS) (IDAPA 58.01.01.203.02 and 58.01.01.577).

4.6.1 Significant Emission/Major Modification Analysis

IDAPA 58.01.01.007 [through incorporation of 40 CFR 52.21(b)] defines a major modification as a change to a major facility that would either result in significant net emission increases (as specified in IDAPA 58.01.01.006.104) of any regulated air pollutant. The results of the conservative emission calculations indicate that the changes proposed for the RCE/ICE *and TSA-R CCE* will not meet the definition of a major modification and qualifies as a "minor" modification to an existing major facility (i.e., the INL).

The results of the significant emission/"minor" modification threshold analysis are shown in Table 4-9. The pollutants listed in the table include those compounds from the significant emissions list specified in IDAPA 58.01.01.006.104 that are expected to be present in the wastes recovered and generated during retrieval and treatment operations. These compounds include asbestos, beryllium, CO, lead, mercury, NO_X, ozone (as VOCs), PM, PM-10 (PM with an aerodynamic diameter less than or equal to 10 microns), *PM-2.5 (PM with an aerodynamic diameter less than or equal to 2.5 microns),* radionuclides, and SO_2. As shown in Table 4-9, all RCE/ICE *and TSA-R CCE* emissions are estimated to be below the significant thresholds. Because the RCE/ICE *and TSA-R CCE* emissions have been conservatively estimated, actual emissions should be well below the threshold values.

4.6.2 TAP Emissions Analysis

IDAPA 58.01.01.203.03 and 58.01.01.210 require that new and modified stationary sources demonstrate that the emissions of TAPs would not injure or unreasonably affect human or animal life or vegetation. Using the methods provided in Section 210, the emissions of TAPs from the modification would not injure or unreasonably affect human or animal life or vegetation as required by IDAPA 58.01.01.161. Compliance with all applicable TAP carcinogenic and non-carcinogenic increment levels will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586 of IDAPA 58.01.01. TAP compounds with Section 585-acceptable ambient concentrations (AACs) for non-carcinogens and/or Section 586-acceptable ambient concentrations for carcinogens (AACCs) that are expected to be present in RCE/ICE *and TSA-R CCE* waste feed (e.g., treatment and retrieval operations) or generated by RCE/ICE *and TSA-R CCE* operations have been identified and included in the TAP analysis.

The TAP analysis presented herein is a conservative case that demonstrates that the RCE/ICE *and the TSA-R CCE* will not exceed TAP AACs/AACCs even when the operations are assumed to encounter TAPs at the maximum retrieval and treatment rate. This is demonstrated despite using conservative assumptions for the release of TAPs during retrieval and treatment operations to the HEPA filters, as well as conservative HEPA filter removal efficiencies for non-VOCs. Therefore, actual emissions from the RCE/ICE *and the TSA-R CCE* are expected to be much lower than the results presented in Tables 4-10 and 4-11.

The organic TAPs addressed in Table 4-10 and the inorganic TAPs addressed in Table 4-11 are assumed to be emitted from the RCE/ICE stack. The process emissions are those reported in Section 4.4. The emissions were then used together with dispersion modeling results to calculate ambient concentrations at the appropriate receptor locations. ~~[INL southern boundary or Experimental Breeder Reactor-I (EBR-I) for the 24-hr average and the annual average~~ *Appropriate receptors are those demonstrating maximum averaging concentrations among all receptors prescribed by ~~the~~ IDEQ for INL modeling applications, as well as a discrete cartesian receptor network (500 meter intervals) extending to all locations accessible to the public within 50 kilometers of the AMWTP.*~~].~~ ~~Although the ambient boundary impacts occur at EBR-I, the maximum impact modeling results were used instead for conservatism.~~ The point of maximum impact occurs at ~~3,715 meters (m) from the stack at a heading of 190°~~ *approximately 337,~~.~~500~~k~~ (UTM E~~e~~asting - meters)* *and 4,812,;500k (UTM Nnorthing - meters), which is* ~~(South~~*approximately 5,603 meters south and 2,417 meters east of the AMWTP RCE/ICE stack*~~near the INL boundary)~~. See Appendix E for additional information.

The calculated ambient concentrations are shown in the column adjacent to the regulatory AACs and/or AACCs in Tables 4-10 and 4-11. All ~~of~~ the calculated ambient concentrations were less than the regulatory AACs and AACCs, under the conservative assumptions of this analysis. A more detailed discussion of the air dispersion model and methodology used to determine the annual and 24-hr dispersion coefficients used in the tables is included in Appendix E.

4.6.3 National Ambient Air Quality Standards Analysis

IDAPA 58.01.01.203.02 requires that new or modified stationary sources demonstrate that they would not cause, or significantly contribute to, a violation of any NAAQS, as specified in Section 577 of IDAPA 58.01.01.

RCE/ICE *and TSA-R CCE* emission estimates for CO, lead (Pb), nitrogen dioxide (NO_2), ozone (VOCs), PM-10, *PM-25,* and SO_2 were used to determine maximum ambient contribution levels from RCE/ICE *and TSA-R CCE* emissions. As discussed in Appendix E, this was accomplished by determining ~~the~~ maximum ~~hourly~~ dispersion coefficients, *with respect to specific averaging periods,* for the RCE/ICE stack via modeling. These maximum dispersion coefficients were then used to determine worst-case ambient concentrations for those pollutants ~~with hourly- or quarterly-averaged concentrations~~ *based on the appropriate averaging period.* ~~For ambient concentrations based on yearly averages, scaling ratios that are calculated based on the hourly dispersion coefficient are calculated via modeling.~~ The ambient concentrations are all below the NAAQS limits. The results are shown in Table 4-12.

~~As of December 20, 2010, PM-2.5 is regulated as a criteria air pollutant. At the time of the submittal of this permit application, the PM-2.5 regulations had not been incorporated into DEQ's annual update of citations to Federal regulations incorporated by reference. However, DEQ provided correspondence on the regulatory limits for new sources or modifications to existing sources. These levels are shown in Table 4-12. Correspondence between AMWTP and DEQ personnel are included in Appendix F.~~

A discussion of the air dispersion model and methodology used to determine the dispersion coefficients used in Table 4-12 is included in Appendix E.

4.7 TSA-RE Annual Emissions Summary

The *anticipated annual emissions from RCE/ICE and TSA-R CCE are summarized in* ~~TSA-RE's anticipated annual emissions are summarized in~~ Table 4-13. These estimates were based on the worst-case emissions reported in Section 4.4, assuming a maximum of 8,760 hrs of operation per year.

4.8 Anticipation of Operational Needs

In order to maximize the flexibility of the RCE/ICE and TSA-R CCE, an evaluation was performed to conservatively allow for tradeoffs between the retrieval and treatment operations as well as whether 2 or 3 stages of HEPA filtration are employed for those operations. Each of the following process-isolation scenarios was evaluated independently, using calculations identical to those used throughout Section 4 and Appendices C and D of this application, to determine the respective maximum operating limit that would not exceed emissions as defined in this application:

- *With 2 HEPA:*
  - *Retrieval of breached containers*
  - *Treatment of waste containers by repackaging/resizing*
  - *Treatment of liquids in waste containers*
- *With 3 HEPA:*
  - *Retrieval of breached containers*
  - *Treatment of waste containers by repackaging/resizing*
  - *Treatment of liquids in waste containers*

The limits resulting from the evaluation were compared to determine which one produces the least emissions per 55-gallon drum equivalent (DE) for use as a baseline. The baseline identified is the scenario in which 752 Equivalent Emission Units (EEU) are retrieved with 3 HEPA. The baseline was divided by each of the other maximum operating limits, taken from the process-isolation scenarios pertaining to this evaluation, to find integers that will be used as the multipliers in Equation 1 of the permit (e.g., 752 divided by 250 is 3.008 [integer of 3], and thus a process which may not exceed 250 containers per day must take credit for the retrieval of three drums using 3 HEPA).

Retrieval of breached containers using only 2 HEPA produces three times the emissions as the same activity does with 3 HEPA. The treatment of liquids in a waste container with 3 HEPA is equivalent to retrieval of a breached container using only 2 HEPA, or the equivalent of retrieving three breached drums using 3 HEPA. The treatment of liquids in a container with only 2 HEPA is the emissions equivalent of retrieving four drums using 3 HEPA. The treatment of waste containers via resizing/repackaging is equivalent to retrieval of waste containers, when the number of HEPA is the same (e.g., 1 repackaged DE using 3 HEPA is the same as 1 breached DE retrieved using 3 HEPA).

It is possible to combine a variety of operations in a given day by ensuring that the EEU resulting from Equation 1 does not exceed 752. See condition 11 of the Permit To Construct for more information including the definition of each variable used in Equation 1.

***Equation 1**:* $EEU = h2 + h3$

where: $h2 = 3 \times (br + re) + 4 \times li$

and: $h3 = br + re + 3 \times li$

Table 4-1. Worst Case AMWTP Waste Concentrations

Pollutant	CAS #	Worst Case Non-Debris	Worst Case Debris	Worst Case Overall
		wt%	wt%	wt%
Volatile Organic Compounds				
Acetone	67-64-1	1	1	1
Benzene	71-43-2	1	1	1
Butanol, n-	71-36-3	0.001	1	1
2-Butanone (Methyl ethyl ketone)	78-98-3	0.0003	1	1
Carbon disulfide	75-15-0	1	1	1
Carbon tetrachloride[a]	56-23-5	1	1	1
Chlorobenzene	108-90-7	0.00005	0.00005	0.00005
Chloroform	67-66-3	0.05	1	1
Cresols (m, p & o)	95-48-7 108-39-4 106-44-5	1	0	1
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	1	0	1
1,4-Dichlorobenzene	106-46-7	1	0	1
Dichloroethane, 1,1- = (Ethylene dichloride)	75-34-3	0.0002	1	1
1,2-Dichloroethane	107-06-2	0.00226	0.000057	0.00226
Dichloroethylene (-1,1)	75-35-4	0.01	0.00016	0.01
cis-1,2-Dichloroethylene	540-59-0	0.00002	1	1
1,2-Dichloropropane (Propylene dichloride)	78-87-5	0	1	1
Divinylbenzene	108-57-6	0	1	1
Ethanol	64-17-5	1	1	1
2-Ethoxyethanol	110-80-5	1	1	1
Ethyl benzene	100-41-4	0.0004	1	1
Ethyl ether	60-29-7	1	0	1
Hexachlorobenzene	118-74-1	0.0000564	0	0.0000564
Hexachloroethane	67-72-1	1	0	1
Isobutanol	78-83-1	0	1	1
Isooctane (2,2,4-Trimethyl pentane)	540-84-1	1	0	1
Isopropanol	67-63-0	1	1	1
Methane[b]	74-82-8	0	1	1
Methanol	67-56-1	1	1	1
Methylene chloride	75-09-2	1	1	1
Methyl isobutyl ketone	108-10-1	0	0.00007	0.00007
Organophosphates[b]	EDF-163	1	0	1
Pentachlorophenol	87-86-5	1	0	1
Polystyrene[b]	9003-53-6	0	1	1
Pyridine	110-86-1	0.01	1	1
1,1,2,2-Tetrachloroethane	79-34-5	0.00001	0	0.00001
Tetrachloroethylene	127-18-4	1	1	1
Toluene	108-88-3	1	1	1
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	2.3	1	2.3
Trichloroethylene	79-01-6	1	1	1
Trichlorofluoromethane[b]	75-69-4	1	0	1

Table 4-1. Worst Case AMWTP Waste Concentrations (continued)

Pollutant	CAS #	Worst Case Non-Debris	Worst Case Debris	Worst Case Overall
		wt%	wt%	wt%
Volatile Organic Compounds (continued)				
1,1,2-Trichloro-1,2,2-trifluoroethane[b]	76-13-1	1	1	1
Varsol[b]	9072-35-9	1	0	1
Xylene	1330-20-7	0.001	1	1
Cyclohexane	100-83-8	0.014	1	1
Nitrobenzene	98-95-3	1	0	1
Mercury	7439-97-6	1	1	1
Particulate Matter				
Aluminum = Al	7429-90-5	0	1	1
Aluminum Oxide = Al2O3	7429-90-5	1	0	1
Arsenic[a]	7440-38-2	0.86	0.86	0.86
Barium	7440-39-3	1	1	1
Beryllium	7440-41-7	1	1	1
Cadmium	7440-43-9	1	1	1
Calcium[b]	7440-70-2	1	0	1
Chromium[a]	7440-47-3	0.24	0.24	0.24
Copper = Cu	7440-50-8	0	1	1
Iron = Fe[b]	7439-89-6	0	1	1
Lead[c]	7439-92-1	1	25	25
Lithium = Li[b]	7439-93-2	1	0	1
Magnesium[b]	7439-95-4	1	1	1
Nickel	7440-02-0	1	0	1
Platinum = Pt	7440-06-4	0	1	1
Selenium	7782-49-2	1	1	1
Silver	7440-22-4	1	1	1
Stainless steel[b]	NA	0	1	1
Tantalum = Ta	7440-25-7	0	1	1
Tungsten = W	7440-33-7	0	1	1
Uranium Metal	7440-61-1	1	0	1
Zinc	7440-66-6	1	1	1
Asbestos[d]	1332-21-4	0	45	45
Benelex[b]	NA	0	1	1
Calcium Chloride = CaCl2[b]	10043-52-4	1	0	1
Calcium Silicate (Microcel E) = Ca2SiO4	1344-95-2	1	0	1
Cyanide	592-01-8	1	1	1
2,4-Dinitrotoluene[b]	121-14-2	1	0	1
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	10028-22-5	1	0	1
Graphite[b]	7782-42-5	0	1	1
Iron Oxide = Fe2O	1309-37-1	1	0	1
Magnesia Cement[b]	NA	1	0	1
Magnesium Oxide = MgO = Periclase	1309-48-4	1	0	1

Table 4-1. Worst Case AMWTP Waste Concentrations (continued)

Pollutant	CAS #	Worst Case Non-Debris	Worst Case Debris	Worst Case Overall
		wt%	wt%	wt%
Magnesium Sulfate = MgSO4[b]	7487-88-9	1	0	1
Nitrate[b]	84145-82-4	1	4.8	4.8
Nitric Acid = HNO3	7697-37-2	1	1	1
Polychlorinated biphenyls (PCBs)	1336-36-3	15	1	15
Portland Cement	65997-15-1	1	1	1
Potassium Nitrate = Saltpeter = K2(NO3)[b]	7757-79-1	1	0	1
Silicon Oxide = SiOx[b]	7631-86-9	1	0	1
Sodium Hydroxide = NaOH = Caustic soda = Lye	1310-73-2	1	0	1
Sodium Nitrate = NaNO3[b]	7631-99-4	1	0	1
Sulfamic/nitric acid[b]	5329-14-6	0	1	1

a. For Arsenic, Chromium, and Carbon Tetrachloride; it was necessary to determine the expected concentration to a greater accuracy other than assigning a 1 wt% concentration. For these constituents, the pollutant was identified for each waste stream that remains to be retrieved/treated. A waste density of 525 lbs/55-gal drum (non-debris waste density) was applied to determine the mass of each constituent that remains to be retrieved/treated. The total mass of the constituent of concern was then divided by the total mass of all waste remaining to be retrieved/treated within the RCE/ICE *and TSA-R CCE*.

b. Pollutant not regulated by IDAPA 58.01.01, "Rules for the Control of Air Pollution in Idaho."

c. The worst-case debris concentration for lead was adjusted from the maximum expected concentration of 56% to a very conservative 25%. The lead in the debris waste is primarily in the form of lead shielding bricks, which are not treated in the RCE/ICE *and TSA-R CCE* other than for repackaging; therefore, little PM is expected to be generated during handling.

d. The worst-case debris concentration for asbestos was adjusted to a very conservative 0.01%. The asbestos in the debris waste is located in a small waste population, which are not treated in the RCE/ICE *and TSA-R CCE* other than for repackaging; therefore, little PM is expected to be generate during handling.

Table 4-2. Nonradioactive Emission Sources and Types of Emissions Expected in the RCE/ICE *and TSA-R CCE*

EMISSION SOURCES	CO	NO_X	SO_2	PM	VOCs	TAPs
Soil Removal (Clean)				X		
Soil Removal (Contaminated)				X	X	X
Breached Container ~~(Drum/Box)~~ Retrieval				X	X	X
~~Cargo Container Retrieval~~				~~X~~	~~X~~	~~X~~
Liquid Treatment (Absorption, Decanting, Neutralization, *etc.*)				X	X	X
Repackaging/Sizing of Waste				X	X	X
Operational Equipment: Telescopic Boom Forklifts, Skid Steer Loaders, Yard Cranes, and Tugs (Diesel engines)	X	X	X	X	X	
RCE Inlet Air (3 Propane-fired units)	X	X	X	X		
Personnel Room 201 Heater (Propane-fire burner)	X	X	X	X		
Personnel Room 206 Heater (Propane-fire burner)	X	X	X	X		
TSA-RE Stand-by Generator (Diesel engine)	X	X	X	X	X	
High Pressure Breathing Air Unit (Diesel engine)	X	X	X	X	X	

Table 4-3. Summary of RCE/ICE Emissions

Pollutant	Worst Case Overall	Drum Retrieval Emission Rate (Unabated)[a,b]	Box Retrieval Emission Rate (Unabated)[a,b]	Cargo Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/ Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
-	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Total VOCs	-	8.53E-06	2.17E-05	4.55E-06	2.23E-06	1.18E-02	2.28E-05	1.19E-02
Acetone	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Benzene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Butanol, n-	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
2-Butanone (Methyl ethyl ketone)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Carbon disulfide	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Carbon tetrachloride[e]	0.78	6.65E-08	1.69E-07	3.55E-08	1.74E-08	9.21E-05	1.77E-07	9.26E-05
Chlorobenzene	0.00005	4.27E-12	1.08E-11	2.28E-12	1.12E-12	5.91E-09	1.14E-11	5.94E-09
Chloroform	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Cresols (m, p & o)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,2-Dichlorobenzene (o-Dichlorobenzene)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,4-Dichlorobenzene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Dichloroethane, 1,1- = (Ethylene dichloride)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,2-Dichloroethane	0.00226	1.93E-10	4.90E-10	1.03E-10	5.05E-11	2.67E-07	5.14E-10	2.68E-07
Dichloroethylene (-1,1)	0.01	8.53E-10	2.17E-09	4.55E-10	2.23E-10	1.18E-06	2.28E-09	1.19E-06
cis-1,2-Dichloroethylene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,2-Dichloropropane (Propylene dichloride)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Divinylbenzene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Ethanol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
2-Ethoxyethanol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Ethyl benzene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Ethyl ether	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Hexachlorobenzene	0.0000564	4.81E-12	1.22E-11	2.57E-12	1.26E-12	6.66E-09	1.28E-11	6.70E-09
Hexachloroethane	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Isobutanol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04

~~**Table 4-3. Summary of RCE/ICE Emissions (continued)**~~

Pollutant	Worst Case Overall	Drum Retrieval Emission Rate (Unabated)[a,b]	Box Retrieval Emission Rate (Unabated)[a,b]	Cargo Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/ Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
-	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Total VOCs (continued)	-							
Isooctane (2,2,4-Trimethyl pentane)	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Isopropanol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Methane	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Methanol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Methylene chloride	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Methyl isobutyl ketone	0.00007	5.97E-12	1.52E-11	3.19E-12	1.56E-12	8.27E-09	1.59E-11	8.31E-09
Organophosphates	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Pentachlorophenol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Polystyrene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Pyridine	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,1,2,2-Tetrachloroethane	0.00001	8.53E-13	2.17E-12	4.55E-13	2.23E-13	1.18E-09	2.28E-12	1.19E-09
Tetrachloroethylene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Toluene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,1,1-Trichloroethane (methyl chloroform)	2.3	1.96E-07	4.99E-07	1.05E-07	5.14E-08	2.72E-04	5.23E-07	2.73E-04
Trichloroethylene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Trichlorofluoromethane	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
1,1,2-Trichloro-1,2,2-trifluoroethane	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Varsol	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Xylene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Cyclohexane	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Nitrobenzene	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Mercury	1	8.53E-08	2.17E-07	4.55E-08	2.23E-08	1.18E-04	2.28E-07	1.19E-04
Total PM	-	**7.88E-04**	**2.00E-03**	**4.20E-04**	**2.06E-04**	**1.58E-03**	**2.10E-03**	**7.09E-03**
Aluminum = Al	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05

Table 4-3. Summary of RCE/ICE Emissions (continued)

Pollutant	Worst Case Overall	Drum Retrieval Emission Rate (Unabated)[a,b]	Box Retrieval Emission Rate (Unabated)[a,b]	Cargo Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/ Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
-	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Aluminum Oxide = Al2O3	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Arsenic[c]	0.86	6.77E-06	1.72E-05	3.61E-06	1.77E-06	1.35E-05	1.81E-05	6.10E-05
Barium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Beryllium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Cadmium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Calcium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Chromium[e]	0.24	1.89E-06	4.80E-06	1.01E-06	4.95E-07	3.78E-06	5.04E-06	1.70E-05
Copper = Cu	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Iron = Fe	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Lead[d]	25	1.97E-04	5.00E-04	1.05E-04	5.15E-05	3.94E-04	5.25E-04	1.77E-03
Lithium = Li	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Magnesium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Nickel	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Platinum = Pt	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Selenium	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Silver	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Stainless steel	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Tantalum = Ta	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Tungsten = W	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Uranium Metal	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Zinc	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Asbestos[e]	0.01	7.88E-08	2.00E-07	4.20E-08	2.06E-08	1.58E-07	2.10E-07	7.09E-07
Benelex	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Calcium Chloride = CaCl2	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Total PM (continued)								
Calcium Silicate (Microcel E) = Ca2SiO4	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Cyanide	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05

Table 4-3. Summary of RCE/ICE Emissions (continued)

Pollutant	Worst Case Overall	Drum Retrieval Emission Rate (Unabated)[a,b]	Box Retrieval Emission Rate (Unabated)[a,b]	Cargo Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/ Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
-	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
2,4-Dinitrotoluene	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Graphite	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Iron Oxide = Fe2O	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Magnesia Cement	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Magnesium Oxide = MgO = Periclase	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Magnesium Sulfate = MgSO4	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Nitrate	4.8	3.78E-05	9.61E-05	2.02E-05	9.89E-06	7.56E-05	1.01E-04	3.40E-04
Nitric Acid = HNO3	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Polychlorinated biphenyls (PCBs)	15	1.18E-04	3.00E-04	6.30E-05	3.09E-05	2.36E-04	3.15E-04	1.06E-03
Portland Cement	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Potassium Nitrate = Saltpeter = K2(NO3)	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Silicon Oxide = SiOx	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Sodium Hydroxide = NaOH = Caustic soda = Lye	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Sodium Nitrate = NaNO3	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05
Sulfamic/nitric acid	1	7.88E-06	2.00E-05	4.20E-06	2.06E-06	1.58E-05	2.10E-05	7.09E-05

a. Emissions do not account for the use of HEPA filters.

b. Emission Rate (lb/hr) = Worst-Case Debris Concentration (wt%/100) x Total "VOC" Emissions (lb/hr) or Total PM (lb/hr).

c. For Arsenic, Chromium, and Carbon Tetrachloride; it was necessary to determine the expected concentration to a greater accuracy other than assigning a 1 wt% concentration. For these constituents, the pollutant was identified for each waste stream that remains to be retrieved/treated. A waste density of 525 lbs/55-gal drum (non-debris waste density) was applied to determine the mass of each constituent that remains to be retrieved/treated. The total mass of the constituent of concern was then divided by the total mass of all waste remaining to be retrieved/treated within the RCE/ICE.

Table 4-3. Summary of RCE/ICE Emissions (continued)

Pollutant	Worst Case Overall	Drum Retrieval Emission Rate (Unabated)[a,b]	Box Retrieval Emission Rate (Unabated)[a,b]	Cargo Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/ Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
-	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr

d. The worst-case debris concentration for lead was adjusted from the maximum expected concentration of 56% to a very conservative 25%. The lead in the debris waste is primarily in the form of lead shielding bricks, which are not treated in the RCE/ICE other than for repackaging; therefore, little PM is expected to be generated during handling.

e. The worst-case debris concentration for asbestos was adjusted to a very conservative 0.01%. The asbestos in the debris waste is in a small waste population, which are not treated in the RCE/ICE other than for repackaging; therefore, little PM is expected to be generate during handling.

Table 4-3. Summary of RCE/ICE and TSA-R CCE Emissions

Pollutant	Worst Case Overall	Breached Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Total VOCs		**9.10E-05**	**2.23E-06**	**6.30E-03**	**1.00E-04**	**6.49E-03**
Acetone	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Benzene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Butanol, n-	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
2-Butanone (Methyl ethyl ketone)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Carbon disulfide	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Carbon tetrachloride[c]	0.78	7.10E-07	1.74E-08	4.91E-05	7.81E-07	5.06E-05
Chlorobenzene	0.00005	4.55E-11	1.12E-12	3.15E-09	5.01E-11	3.25E-09
Chloroform	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Cresols (m, p & o)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,2-Dichlorobenzene (o-Dichlorobenzene)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,4-Dichlorobenzene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Dichloroethane, 1,1- = (Ethylene dichloride)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,2-Dichloroethane	0.00226	2.06E-09	5.05E-11	1.42E-07	2.26E-09	1.47E-07
Dichloroethylene (-1,1)	0.01	9.10E-09	2.23E-10	6.30E-07	1.00E-08	6.49E-07
cis-1,2-Dichloroethylene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,2-Dichloropropane (Propylene dichloride)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Divinylbenzene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Ethanol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
2-Ethoxyethanol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Ethyl benzene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Ethyl ether	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Hexachlorobenzene	0.0000564	5.13E-11	1.26E-12	3.55E-09	5.65E-11	3.66E-09
Hexachloroethane	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Isobutanol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05

Table 4-3. Summary of RCE/ICE and TSA-R CCE Emissions (continued)

Pollutant	Worst Case Overall	Breached Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Total VOCs (continued)						
Isooctane (2,2,4-Trimethyl pentane)	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Isopropanol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Methane	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Methanol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Methylene chloride	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Methyl isobutyl ketone	0.00007	6.37E-11	1.56E-12	4.41E-09	7.01E-11	4.55E-09
Organophosphates	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Pentachlorophenol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Polystyrene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Pyridine	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,1,2,2-Tetrachloroethane	0.00001	9.10E-12	2.23E-13	6.30E-10	1.00E-11	6.49E-10
Tetrachloroethylene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Toluene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,1,1-Trichloroethane (methyl chloroform)	2.3	2.09E-06	5.14E-08	1.45E-04	2.30E-06	1.49E-04
Trichloroethylene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Trichlorofluoromethane	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
1,1,2-Trichloro-1,2,2-trifluoroethane	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Varsol	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Xylene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Cyclohexane	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Nitrobenzene	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Mercury	1	9.10E-07	2.23E-08	6.30E-05	1.00E-06	6.49E-05
Total PM		**8.40E-03**	**2.06E-04**	**8.40E-04**	**9.24E-03**	**1.87E-02**
Aluminum = Al	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Aluminum Oxide = Al2O3	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Arsenic[c]	0.86	7.22E-05	1.77E-06	7.22E-06	7.95E-05	1.61E-04

Table 4-3. Summary of RCE/ICE and TSA-R CCE Emissions (continued)

Pollutant	Worst Case Overall	Breached Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Barium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Beryllium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Cadmium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Calcium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Chromium[c]	0.24	2.02E-05	4.95E-07	2.02E-06	2.22E-05	4.48E-05
Copper = Cu	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Iron = Fe	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Lead[d]	25	2.10E-03	5.15E-05	2.10E-04	2.31E-03	4.67E-03
Lithium = Li	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Magnesium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Nickel	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Platinum = Pt	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Selenium	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Silver	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Stainless steel	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Tantalum = Ta	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Tungsten = W	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Uranium Metal	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Zinc	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Asbestos[e]	0.01	3.78E-03	2.06E-08	3.78E-04	4.16E-03	8.41E-03
Benelex	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Calcium Chloride = CaCl2	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Total PM (continued)						
Calcium Silicate (Microcel E) = Ca2SiO4	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Cyanide	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
2,4-Dinitrotoluene	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Graphite	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04

Table 4-3. Summary of RCE/ICE and TSA-R CCE Emissions (continued)

Pollutant	Worst Case Overall	Breached Container Retrieval Emission Rate (Unabated)[a,b]	Contaminated Soil Emission Rate (Unabated)[a,b]	Liquid Treatment Emission Rate (Unabated)[a,b]	Repackaging/Sizing Emission Rate (Unabated)[a,b]	Total Emission Rate (Unabated)[a]
	wt%	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Iron Oxide = Fe2O	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Magnesia Cement	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Magnesium Oxide = MgO = Periclase	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Magnesium Sulfate = MgSO4	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Nitrate	4.8	4.03E-04	9.89E-06	4.03E-05	4.44E-04	8.97E-04
Nitric Acid = HNO3	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Polychlorinated biphenyls (PCBs)	15	1.26E-03	3.09E-05	1.26E-04	1.39E-03	2.80E-03
Portland Cement	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Potassium Nitrate = Saltpeter = K2(NO3)	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Silicon Oxide = SiOx	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Sodium Hydroxide = NaOH = Caustic soda = Lye	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Sodium Nitrate = NaNO3	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04
Sulfamic/nitric acid	1	8.40E-05	2.06E-06	8.40E-06	9.24E-05	1.87E-04

a. Emissions do not account for the use of HEPA filters.

b. Emission Rate (lb/hr) = Worst-Case Debris Concentration (wt%/100) x Total "VOC" Emissions (lb/hr) or Total PM (lb/hr).

c. For Arsenic, Chromium, and Carbon Tetrachloride; it was necessary to determine the expected concentration to a greater accuracy other than assigning a 1 wt% concentration. For these constituents, the pollutant was identified for each waste stream that remains to be retrieved/treated. A waste density of 525 lbs/55-gal drum (non-debris waste density) was applied to determine the mass of each constituent that remains to be retrieved/treated. The total mass of the constituent of concern was then divided by the total mass of all waste remaining to be retrieved/treated within the RCE/TSA-R CCE.

d. The worst-case debris concentration for lead was adjusted from the maximum expected concentration of 56% to a very conservative 25%. The lead in the debris waste is primarily in the form of lead shielding bricks, which are not treated in the RCE/TSA-R CCE other than for repackaging; therefore, little PM is expected to be generated during handling.

e. The worst-case debris concentration for asbestos was adjusted to a very conservative 0.01%. The asbestos in the debris waste is in a small waste population, which are not treated in the RCE/TSA-R CCE other than for repackaging; therefore, little PM is expected to be generate during handling.

Table 4-4. Summary of Propane Burning Equipment for RCE/ICE *and TSA-R CCE*

~~RCE/ICE HVAC Fuel-Burning Equipment~~								
Equipment Tag #	**Description**	**Location[a,b]**	**Manufacturer**	**Model**	**Electrical**	**Propane use[c]**	**Propane use[c]**	
AHU-101-001	Make-up air unit	Outside (Under Canopy)	Greenheck	IGX-120-H32	10 hp	1200 Mbh input	1.2	MMBtu/hr
AHU-101-002	Make-up air unit	Outside (Under Canopy)	Greenheck	IGX-120-H32	7.5 hp	1200 Mbh input	1.2	MMBtu/hr
AHU-101-003	Make-up air unit	Outside (Under Canopy)	Greenheck	IGX-120-H32	7.5 hp	1200 Mbh input	1.2	MMBtu/hr
UH-101-001	Propane Unit Heater	Room 201	Reznor	UDAP150	120v/1Φ	150 Mbh input	0.15	MMBtu/hr
UH-101-002	Propane Unit Heater	Room 206	Reznor	UDAP75	120v/1Φ	75 Mbh input	0.075	MMBtu/hr
						Total =	**3.825**	**MMBtu/hr**

a. All three make-up air units can run simultaneously at reduced airflow in the event that inside space temperature cannot be maintained by two units.

b. Although unlikely, all the heating components shown above have the potential to operate simultaneously for continued periods.

c. Mbh = thousands of Btu per hour, MMBtu/hr = million Btu per hour

Table 4-5. Summary of Criteria Pollutant Emissions from RCE/ICE *and TSA-R CCE* Heaters

Criteria Air Pollutants	Emission Factor[a,b,c,d,e]	Emissions[f,g]	Emissions[h]
	lb/MMscf	lb/hr	ton/yr[h]
PM_{10} 24-hour 1. EF=NG	7.6	1.16E-02	2.54E-02
$PM_{2.5}$ 24-hour 1. EF=NG	7.6	1.16E-02	---
$PM_{2.5}$ annual 1. EF=NG	7.6	1.16E-02	2.54E-02
CO 1-hr, 8-hr 1. EF=NG	84	1.29E-01	2.81E-01
NO_2 1-hr 2. EF_{NG}x1.5	100	1.53E-01	---
NO_2 annual 2. EF_{NG}x1.5	100	1.53E-01	3.34E-01
SOx 3hr	41.0	6.27E-02	---
SOx 24hr	41.0	6.27E-02	---
SOx annual	41.0	6.27E-02	1.37E-01
VOC 1. EF=NG	5.5	8.42E-03	1.84E-02
Lead rolling 3-month		0.00E+00	0.00E+00
		TOTAL =	**3.53E-01**

a. Assumes PM, CO, and TOC emissions are the same, on a heat input basis, as for natural gas [AP-42 Section 1.4 (07/98)], accounted for by using the average HHV of propane (2,500 Btu/scfm).

b. Propane NO_2 emissions are ~1.5 times higher than NO_2 emissions using natural gas.

c. From AP-42 Section 1.5: 1) Propane heat content = 91.5×10^6 Btu/10^3 gal, and 2) Propane SO_2 = 0.10S lb/1,000 gal where S equals the sulfur content expressed in gr/100 ft^3 gas vapor.

d. From Santa Barbara Air Pollution Control District, http://www.sbcapck.org/eng/tech/sulfur01.htm, Sulfur content = 15 gr/100 ft^3.

e. SO_2 (lb/MMscf) = 0.10 x (15 gr/100 ft3)/1,000 gal x (2,500 MMBtu/MMscf) x (1,000 gal/91.5 MMBtu) = 41.0 lb SO2/MMscf.

f. Propane Usage (MMscf/hr) = Propane Usage (MMBtu/hr) / HHV propane (MMBtu/MMscf) = 3.825 MMBtu/hr / 2,500 MMBtu/MMscf = 1.53E-03 MMscf/hr.

g. Emissions (lb/hr) = Emission Factor (lb/MMscf) x Propane Usage (MMscf/hr) = Emission Factor (lb/MMscf) x 1.53E-03 (MMscf/hr).

h. Heaters are assumed to be under continuous operation for 6 months of the year (24 hr/day, 7 days/wk, 26 wk/yr). Emissions (ton/yr) = Emission Factor (lb/hr) x (24 hr/day) x (7 day/wk) x (26 wk/yr) x (1 ton/2000 lb).

Table 4-6. Summary of TAP Emissions from RCE/ICE *and TSA-R CCE* Heaters

Criteria Air Pollutants	Emission Factor[a]	Calculated Emissions[b,c, d, e,f]	Emission Limit[f,g]
	lb/ 1,000 gal	**lb/hr**	**lb/hr**
Poly-Aromatic Hydrocarbon (PAH) Hazardous Air Pollutant (HAP)			
PAHs (excluding Naphthalene)	1.00E-05	**4.18E-07**	**9.10E-05**
Naphthalene	3.00E-05	1.25E-06	3.33
Non-PAH HAPs			
Acetaldehyde	3.80E-04	**1.59E-05**	**3.00E-03**
Acrolein	2.40E-04	1.00E-05	0.017
Benzene	7.10E-04	**2.97E-05**	**8.00E-04**
Ethyl benzene	8.40E-04	3.51E-05	29
Formaldehyde	1.51E-03	**6.31E-05**	**5.10E-04**
Hexane	5.60E-04	2.34E-05	12
Toluene	3.25E-03	1.36E-04	25
Xylene	2.41E-03	1.01E-04	29
Non-HAP Pollutants			
Ammonia	0.30	1.25E-02	1.2

a. Emission factors for propane combustion toxics for units < 10 MMBtu/hr obtained from http://www.aqmd.gov/aer/Updates/SupplnstruforAB2588Facilities.pdf. Issued January 2010.
b. Total propane usage is 3.825 MMBtu/hr, as shown in Table 4-4.
c. From AP-42 Section 1.5: Propane heat content = $91.5x10^6$ Btu/10^3 gal.
d. Propane Flow Rate (1000 gal/hr) = Propane Usage (MMBtu/hr) x (1000 gal/91.5MMBtu).
e. Calculated Emission (lb/hr) = Propane Flow Rate (1000 gal/hr) x Emission Factor (lb/1000 gal).
f. Emissions are 24-hr averages unless shown in bold. Bold emissions are averages for carcinogens.
g. TAP emission limit, AAC, and AACC values per IDAPA 58.01.01.585 and 586.

Table 4-7. Emission Rate for Diesel Powered Mobile Units

	AP-42[a]	Fork Lifts[b]	Skid Steer Loaders[c]	Yard Crane[d]	Tugs[e]	Diesel Emissions Filter[f]
	*g/(HP*hr)* [g]	*g/(HP*hr)*	*g/(HP*hr)*	*g/(HP*hr)*	*g/(HP*hr)*	*% Removed*
Carbon monoxide	3.00E+00	5.00E-01	1.20E+00	4.70E-01	3.30E+00	NA
Nitrogen oxides	1.40E+01	7.50E+00	5.20E+00	6.20E+00	5.80E+00	NA
Sulfur dioxide	1.10E+00	*1.10E+00*	1.70E-01	*1.10E+00*	*1.10E+00*	NA
PM/PM-10	1.00E+00	9.00E-02	2.50E-01	8.60E-02	4.30E-01	NA
Hydrocarbons (VOCs)	1.10E+00	1.60E-01	6.00E-01	2.30E-01	7.30E-01	NA

a. AP-42 Section 3.4 provides conservative estimates for diesel engine emissions. Where vendor specific data was not available, AP-42 numbers were substituted as a conservative estimate and italicized.
b. Make and model: Gehl DL-10, Engine: John Deere Model 4045TF150. Numbers from email from Tom Eggers, Product Development Manager, Telescopic Products at Gehl. via Kelly Moore at Gehl Corp.
c. Make and model: Gehl 4835, Engine: Deutz Model BF3M1011). Numbers from email from Joe Unseth, Emissions Engineer at Deutz Corp. via Kelly Moore at Gehl Corp.
d. Make and model: Grove YB4415, Engine: Cummins 4BT3.9 L turbo-charged diesel. Numbers from EPA website http://www.epa.gov/otag/certdata.htm. Under 2001 Model Year, select 2001 MY lggen.wk1 file. Data from Row 567 after opening in OpenOfficeCalc. Units converted from g/kW*hr to g/HP*hr by dividing number by 1.341 (1 kW=1.341 HP).
e. Make and model: NMC-Wollard 60, Engine: Cummins 4B3.9 L diesel. Numbers from EPA website http://www.epa.gov/otag/certdata.htm. Under 2001 Model Year, select 2001 MY lggen.wk1 file. Data from Row 583 after opening in OpenOfficeCalc. Units converted from g/kW*hr to g/HP*hr by dividing number by 1.341 (1kW=1.341 HP).
f. Each diesel powered unit will be equipped with an filter to reduce the off-gas emitted within the RCE/ICE.
g. Grams per horse power per hour.

Table 4-8. Summary of Emissions from Diesel Engines

Pollutant	Emission Levels									
	Fork Lifts[a]	Skid Steer Loaders[a]	Yard Crane[a]	Tugs[a]	Total Hourly Emissions	Fork Lifts[b]	Skid Steer Loaders[b]	Yard Crane[b]	Tugs[b]	Total Annual Emissions
Number of Units	2	2	1	1	-	2	2	1	1	-
-	HP[c]	HP[c]	HP[c]	HP[c]	-	hrs/yr[d]	hrs/yr[d]	hrs/yr[d]	hrs/yr[d]	-
-	115	57	110	80	-	8736	8736	8736	8736	-
-	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Carbon monoxide	2.54E-01	3.02E-01	1.14E-01	5.82E-01	1.25E+00	1.11E+00	1.32E+00	4.98E-01	2.54E+00	5.46E+00
Nitrogen oxides	3.80E+00	1.31E+00	1.50E+00	1.02E+00	7.64E+00	1.66E+01	5.71E+00	6.57E+00	4.47E+00	3.34E+01
Sulfur dioxide	5.58E-01	4.27E-02	2.67E-01	1.94E-01	1.06E+00	2.44E+00	1.87E-01	1.17E+00	8.47E-01	4.64E+00
PM/PM-10	4.56E-02	6.28E-02	2.09E-02	7.58E-02	2.05E-01	1.99E-01	2.74E-01	9.11E-02	3.31E-01	8.96E-01
Ozone (VOCs)	8.11E-02	1.51E-01	5.58E-02	1.29E-01	4.16E-01	3.54E-01	6.59E-01	2.44E-01	5.62E-01	1.82E+00

a. Emission (lb/hr) = Emission Rate (g/HP*hr) * HP of Unit (HP) *(1 lb/453.6 g) * Number of Units. Emission Rate from Table 4-7.
b. Emission (ton/yr) = Emission (lb/hr) x Operational Hours (hr/yr) x (1 ton/2000 lb).
c. Horse power (HP) for telescopic boom forklifts, skid steer loaders, yard crane, and tugs provided from Mike Gray at WGI to Greg Hula at BNFL via fax.
d. Diesel equipment is assumed to be under continuous operation for 12 months of the year (24 hr/day, 7 days/wk, 52 wk/yr).

Table 4-8. Summary of Emissions from Diesel Engines

Pollutant	Emission Levels									
	Fork Lifts[a]	Skid Steer Loaders[a]	Yard Crane[a]	Tugs[a]	Total Hourly Emissions	Fork Lifts[b]	Skid Steer Loaders[b]	Yard Crane[b]	Tugs[b]	Total Annual Emissions
Number of Units	3	2	1	1		3	2	1	1	
	HP [c]	HP [c]	HP [c]	HP [c]		hrs/yr [d]	hrs/yr [d]	hrs/yr [d]	hrs/yr [d]	
	115	57	110	80		8736	8736	8736	8736	
	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Carbon monoxide	3.80E-01	3.02E-01	1.14E-01	5.82E-01	1.25E+00	1.66E+00	1.32E+00	4.98E-01	2.54E+00	6.02E+00
Nitrogen oxides	5.70E+00	1.31E+00	1.50E+00	1.02E+00	7.64E+00	2.49E+01	5.71E+00	6.57E+00	4.47E+00	4.17E+01
Sulfur dioxide	8.37E-01	4.27E-02	2.67E-01	1.94E-01	1.06E+00	3.65E+00	1.87E-01	1.17E+00	8.47E-01	5.85E+00
PM/PM-10	6.85E-02	6.28E-02	2.09E-02	7.58E-02	2.05E-01	2.99E-01	2.74E-01	9.11E-02	3.31E-01	9.96E-01
Ozone (VOCs)	1.22E-01	1.51E-01	5.58E-02	1.29E-01	4.16E-01	5.32E-01	6.59E-01	2.44E-01	5.62E-01	2.00E+00

*a. Emission (lb/hr) = Emission Rate (g/HP*hr) * HP of Unit (HP) *(1 lb/453.6 g) * Number of Units. Emission Rate from Table 4-7.*
b. Emission (ton/yr) = Emission (lb/hr) x Operational Hours (hr/yr) x (1 ton/2000 lb).
c. Horse power (HP) for telescopic boom forklifts, skid steer loaders, yard crane, and tugs provided from Mike Gray at WGI to Greg Hula at BNFL via fax.
d. Diesel equipment is assumed to be under continuous operation for 12 months of the year (24 hr/day, 7 days/wk, 52 wk/yr).

Table 4-9. Significant Emission Levels/Threshold Analysis

Pollutant	Total Emissions Generated During Retrieval Operations[a,b]	Total Emissions Generated During Treatment Operations[b,c]	Total Emissions Generated During Non-Contaminated Soil Removal[b,d]	Propane Heater Emissions[e]	Diesel Powered Equipment Emissions[f]	Total Estimate of RCE/ICE Emissions	*Significant Emission Limit*[g]	*% of SEL*
-	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	-
Carbon monoxide	0	0	0	2.81E-01	5.46E+00	5.75E+00	100	5.75%
Nitrogen oxides	0	0	0	3.34E-01	3.34E+01	3.37E+01	40	84.22%
Sulfur dioxide	0	0	0	1.37E-01	4.64E+00	4.77E+00	40	11.93%
Particulate matter (PM)	6.20E-09	1.61E-11	3.44E-09	2.54E-02	8.96E-01	9.22E-01	25	3.69%
PM-10	6.20E-09	1.61E-11	3.44E-09	2.54E-02	8.96E-01	9.22E-01	15	6.14%
PM-2.5	6.20E-09	1.61E-11	3.44E-09	2.54E-02	8.96E-01	9.22E-01		
Ozone (as VOCs)	1.62E-04	5.18E-02	0	1.84E-02	1.82E+00	1.89E+00	40	4.72%
Asbestos	6.20E-13	1.61E-15	0	0	0	6.22E-13	0.007	0.00%
Lead	1.55E-09	4.02E-12	0	0.00E+00	0	1.55E-09	0.6	0.00%
Beryllium	6.20E-11	1.61E-13	0	0	0	6.22E-11	0.0004	0.00%
Mercury	1.62E-06	5.18E-04	0	0	0	5.20E-04	0.1	0.52%
-	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	-
Radionuclides (EDE)[h]	1.94E-04	2.69E-05	0.00E+00	0.00E+00	0.00E+00	2.20E-04	0.1	0.22%

a. Total Emissions Generated During Retrieval Operations (drum retrieval, box retrieval, cargo container retrieval, contaminated soil removal, and non-contaminated soil removal) were calculated by adding the emissions from each retrieval operation. Assumed a maximum 8,760 operating hours per year.

b. Abated release (99.9% per filter for HEPA efficiency). Radionuclide emission calculations are detailed in Section 3.

c. Total Emissions Generated During Treatment Operations (Liquid treatment and Repackaging/Sizing) were calculated by adding the emissions from each activity. Assumed a maximum 8,760 operating hours per year.

d. Emissions for PM from removal on all non-contaminated soil as shown in Table D-2 of Appendix D.

e. Propane heater emissions from Table 4-5.

f. Diesel powered equipment emissions from Table 4-8.

g. Significant Emission Limits taken from IDAPA 58.01.01.006.104

h. Abated release. Radionuclide emissions calculated in Appendix C.

Table 4-9. Significant Emission Levels/Threshold Analysis

Pollutant	Total Emissions Generated During Retrieval Operations[a,b]	Total Emissions Generated During Treatment Operations[b,c]	Total Emissions Generated During Non-Contaminated Soil Removal[b,d]	Propane Heater Emissions[e]	Diesel Powered Equipment Emissions[f]	Total Estimate of Emissions	Significant Emission Limit[g]	% of SEL
-	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	-
Carbon monoxide	0	0	0	2.81E-01	6.02E+00	6.30E+00	100	6.30%
Nitrogen oxides	0	0	0	3.34E-01	4.17E+01	4.20+01	40	105.00%
Sulfur dioxide	0	0	0	1.37E-01	5.85E+00	5.99E+00	40	14.98%
Particulate matter (PM)	3.77E-08	4.42E-08	3.44E-09	2.54E-02	9.96E-01	1.02E+00	25	3.69%
PM-10	3.77E-08	4.42E-08	3.44E-09	2.54E-02	9.96E-01	1.02E+00	15	6.14%
PM-2.5	3.77E-08	4.42E-08	3.44E-09	2.54E-02	9.96E-01	1.02E+00		
Ozone (as VOCs)	4.08E-04	2.80E-02	0	1.84E-02	2.00E+00	2.04E+00	40	5.1%
Asbestos	1.70E-08	1.99E-08	0	0	0	3.68E-08	0.007	0.00%
Lead	9.42E-09	1.10E-08	0	0	0	2.05E-08	0.6	0.00%
Beryllium	3.77E-10	4.42E-10	0	0	0	8.18E-10	0.0004	0.00%
Mercury	4.08E-06	2.80E-04	0	0	0	2.84E-04	0.1	0.28%
-	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	-
Radionuclides (EDE)[h]	—	—	0.00E+00	0.00E+00	0.00E+00	4.84E-04	0.1	0.48%

a. Total Emissions Generated During Retrieval Operations (drum retrieval, box retrieval, cargo container retrieval, contaminated soil removal, and non-contaminated soil removal) were calculated by adding the emissions from each retrieval operation. Assumed a maximum 8,760 operating hours per year.
b. Abated release (99.9% per filter for HEPA efficiency). Radionuclide emission calculations are detailed in Section 3.
c. Total Emissions Generated During Treatment Operations (Liquid treatment and Repackaging/Sizing) were calculated by adding the emissions from each activity. Assumed a maximum 8,760 operating hours per year.
d. Emissions for PM from removal on all non-contaminated soil as shown in Table D-2 of Appendix D.
e. Propane heater emissions from Table 4-5.
f. Diesel powered equipment emissions from Table 4-8.
g. Significant Emission Limits taken from IDAPA 58.01.01.006.104
h. Abated release. Radionuclide emissions calculated in Appendix C.

Table 4-9 Significant Emission Limit/Threshold Analysis

Pollutant	Total Emissions Generated During Retrieval Operations[a,b]	Total Emissions Generated During Treatment Operations[b,c]	Total Emissions Generated During Non-Contaminated Soil Removal[b,d]	Propane Heater Emissions[e]	Diesel Powered Equipment Emissions[f]	Total Estimate of Emissions	Total Estimate of All TSA-RE Emissions From Previous Project (Permit Number P-2011.0109)	Difference Between Emissions From Proposed Project and Previous Project (Permit Number P-2011.0109)	Significant Emission Limit[g]	% of SEL
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	
Carbon monoxide	0	0	0	2.81E-01	6.02E+00	6.30E+00	5.75E+00	5.49E-01	100	0.55%
Nitrogen oxides	0	0	0	3.34E-01	4.17E+01	4.20+01	3.37E+01	8.29E+00	40	20.74%
Sulfur dioxide	0	0	0	1.37E-01	5.85E+00	5.99E+00	4.77E+00	1.22E+00	40	3.05%
Particulate matter (PM)	3.77E-08	4.42E-08	1.50E-08	2.54E-02	9.96E-01	1.02E+00	9.22E-01	9.92E-02	25	0.40%
PM-10	3.77E-08	4.42E-08	1.50E-08	2.54E-02	9.96E-01	1.02E+00	9.22E-01	9.92E-02	15	0.66%
PM-2.5	3.77E-08	4.42E-08	1.50E-08	2.54E-02	9.96E-01	1.02E+00	9.22E-01	9.92E-02		
Ozone (as VOCs)	4.08E-04	2.80E-02	0	1.84E-02	2.00E+00	2.04E+00	1.89E+00	1.53E-01	40	0.38%
Asbestos	1.70E-08	1.99E-08	0	0	0	3.68E-08	6.22E-13	3.68E-08	0.007	0.00%
Lead	9.42E-09	1.10E-08	0	0	0	2.05E-08	1.55E-09	1.89E-08	0.6	0.00%
Beryllium	3.77E-10	4.42E-10	0	0	0	8.18E-10	6.22E-11	7.56E-10	0.0004	0.00%
Mercury	4.08E-06	2.80E-04	0	0	0	2.84E-04	5.20E-04	0.00E+00	0.1	0.00%
	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	---
Radionuclides (EDE)[h]	---	---	0.00E+00	0.00E+00	0.00E+00	4.84E-04	2.20E-04	2.64E-04	0.1	0.26%

a. Total Emissions Generated During Retrieval Operations (drum retrieval, box retrieval, cargo container retrieval, contaminated soil removal, and non-contaminated soil removal) were calculated by adding the emissions from each retrieval operation. Assumed a maximum 8,760 operating hours per year.
b. Abated release (99.9% per filter for HEPA efficiency). Radionuclide emission calculations are detailed in Section 3.
c. Total Emissions Generated During Treatment Operations (Liquid treatment and Repackaging/Sizing) were calculated by adding the emissions from each activity. Assumed a maximum 8,760 operating hours per year.
d. Emissions for PM from removal on all non-contaminated soil as shown in Table D-2 of Appendix D.
e. Propane heater emissions from Table 4-5.
f. Diesel powered equipment emissions from Table 4-8.
g. Significant Emission Limits taken from IDAPA 58.01.01.006.104
h. Abated release. Radionuclide emissions calculated in Appendix C.

~~Table 4-10. TAP Concentrations for Organics~~

Pollutant	Maximum RCE/ICE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m³) AACC (µg/m³) Limits	% of AAC/AACC
-	(lb/hr)	(lb/hr)	(lb/hr)	-	(µg/m3 per lb/hr)	mg/m3	µg/m3	-	-
Acetone	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	89	0%
Benzene	1.19E-04	2.97E-05	1.48E-04	C	1.776	-	2.64E-04	0.12	0%
Butanol, n-	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	7	0%
2-Butanone (Methyl ethyl ketone)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	29.5	0%
Carbon disulfide	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	1.5	0%
Carbon tetrachloride	9.26E-05	0	9.26E-05	C	1.776	-	1.64E-04	0.067	0%
Chlorobenzene	5.94E-09	0	5.94E-09	N	10.65	6.32E-11	-	17.5	0%
Chloroform	1.19E-04	0	1.19E-04	C	1.776	-	2.11E-04	0.043	0%
Cresols (m, p & o)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	1.1	0%
1,2-Dichlorobenzene (o-Dichlorobenzene)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	15	0%
1,4-Dichlorobenzene	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	22.5	0%
Dichloroethane, 1,1 = (Ethylene dichloride)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	20.25	0%
1,2-Dichloroethane	2.68E-07	0	2.68E-07	C	1.776	-	4.77E-07	0.038	0%
Dichloroethylene (-1,1)	1.19E-06	0	1.19E-06	C	1.776	-	2.11E-06	0.02	0%
cis-1,2-Dichloroethylene	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	39.5	0%
1,2-Dichloropropane (Propylene dichloride)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	17.35	0%
Divinylbenzene	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	2.5	0%
Ethanol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	94	0%
2-Ethoxyethanol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	0.95	0%
Ethyl benzene	1.19E-04	3.51E-05	1.54E-04	N	10.65	1.64E-06	-	21.75	0%
Ethyl ether	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	60	0%
Hexachlorobenzene	6.70E-09	0	6.70E-09	C	1.776	-	1.19E-08	0.002	0%
Hexachloroethane	1.19E-04	0	1.19E-04	C	1.776	-	2.11E-04	0.25	0%

Table 4-10. TAP Concentrations for Organics (continued)

Pollutant	Maximum RCE/ICE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC (µg/m^3) Limits	% of AAC/AACC
-	(lb/hr)	(lb/hr)	(lb/hr)	-	(µg/m3 per lb/hr)	mg/m3	µg/m3	-	-
Isobutanol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	6	0%
Isooctane (2,2,4-Trimethyl pentane)	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	17.5	0%
Isopropanol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	49	0%
Methane	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
Methanol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	13	0%
Methylene chloride	1.19E-04	0	1.19E-04	C	1.776	-	2.11E-04	0.24	0%
Methyl isobutyl ketone	8.31E-09	0	8.31E-09	N	10.65	8.85E-11	-	10.25	0%
Organophosphates	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
Pentachlorophenol	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	0.025	0%
Polystyrene	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
Pyridine	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	0.75	0%
1,1,2,2-Tetrachloroethane	1.19E-09	0	1.19E-09	C	1.776	-	2.11E-09	0.017	0%
Tetrachloroethylene	1.19E-04	0	1.19E-04	C	1.776	-	2.11E-04	2.1	0%
Toluene	1.19E-04	1.36E-04	2.55E-04	N	10.65	2.71E-06	-	18.75	0%
1,1,1-Trichloroethane (methyl chloroform)	2.73E-04	0	2.73E-04	N	10.65	2.91E-06	-	95.5	0%
Trichloroethylene	1.19E-04	0	1.19E-04	C	1.776	-	2.11E-04	0.77	0%
Trichlorofluoromethane	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
Varsol	1.19E-04	0	1.19E-04	NA	NA	NA	NA	NA	NA
Xylene	1.19E-04	1.01E-04	2.19E-04	N	10.65	2.34E-06	-	21.75	0%
Cyclohexane	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	52.5	0%
Nitrobenzene	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	0.25	0%
Mercury	1.19E-04	0	1.19E-04	N	10.65	1.26E-06	-	0.005	0%
PAHs (excluding Naphthalene)	0	4.18E-07	4.18E-07	C	1.776	-	7.42E-07	1.40E-02	0%
Naphthalene	0	1.25E-06	1.25E-06	N	10.65	1.34E-08	-	3.33	0%

Table 4-10. TAP Concentrations for Organies (continued)

Pollutant	Maximum RCE/ICE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m³) AACC (μg/m³) Limits	% of AAC/AACC
-	(lb/hr)	(lb/hr)	(lb/hr)	-	(μg/m3 per lb/hr)	mg/m3	μg/m3	-	-
Acetaldehyde	0	1.59E-05	1.59E-05	C	1.776	-	2.82E-05	4.50E-01	0%
Acrolein	0	1.00E-05	1.00E-05	N	10.65	1.07E-07	-	0.0125	0%
Formaldehyde	0	6.31E-05	6.31E-05	C	1.776	-	1.12E-04	7.70E-02	0%
Hexane	0	2.34E-05	2.34E-05	N	10.65	2.49E-07	-	9	0%
Ammonia	0	1.25E-02	1.25E-02	N	11.65	1.46E-04	-	0.9	0%

a. Maximum RCE/ICE emission rates for all activities. See Table 4-3.

b. Heater emissions rates for organics provided in Table 4-6.

c. N = Non-carcinogen TAP per IDAPA 58.01.01.585. C = Carcinogen TAP per IDAPA 58.01.01.586. NA = Not regulated per IDAPA 58.01.01.585, 58.01.01.586, or 58.01.01.006.

d. Dispersion coefficient determined with a regulatory compliant AERSCREEN air dispersion screening model. The value for non-carcinogens, 10.65 micrograms/m³ per lb/hr represents the 24-hour scaling maximum, and the value for carcinogens, 1.776 micrograms/m³ per lb/hr represents the annual scaling maximum.

e. Calculated AAC (mg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (μg/m3 per lb/hr) x (1 mg/1000 μg).

f. Calculated AACC (μg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (μg/m3 per lb/hr).

Table 4-10. TAP Concentrations for Organics

Pollutant	Maximum RCE/ICE & TSA-R CCE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC ($\mu g/m^3$) Limits	% of AAC/AACC
	(lb/hr)	(lb/hr)	(lb/hr)		(µg/m3 per lb/hr)	mg/m3	µg/m3		
Acetone	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	89	0%
Benzene	6.49E-05	2.97E-05	9.46E-05	C	0.04854	-	4.59E-06	0.12	0%
Butanol, n-	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	7	0%
2-Butanone (Methyl ethyl ketone)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	29.5	0%
Carbon disulfide	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	1.5	0%
Carbon tetrachloride	5.06E-05	0	5.06E-05	C	0.04854	-	2.46E-06	0.067	0%
Chlorobenzene	3.25E-09	0	3.25E-09	N	0.85747	2.78E-12	-	17.5	0%
Chloroform	6.49E-05	0	6.49E-05	C	0.04854	-	3.15E-06	0.043	0%
Cresols (m, p & o)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	1.1	0%
1,2-Dichlorobenzene (o-Dichlorobenzene)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	15	0%
1,4-Dichlorobenzene	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	22.5	0%
Dichloroethane, 1,1- = (Ethylene dichloride)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	20.25	0%
1,2-Dichloroethane	1.47E-07	0	1.47E-07	C	0.04854	-	7.12E-09	0.038	0%
Dichloroethylene (-1,1)	6.49E-07	0	6.49E-07	C	0.04854	-	3.15E-08	0.02	0%
cis-1,2-Dichloroethylene	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	39.5	0%
1,2-Dichloropropane (Propylene dichloride)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	17.35	0%
Divinylbenzene	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	2.5	0%
Ethanol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	94	0%
2-Ethoxyethanol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	0.95	0%
Ethyl benzene	6.49E-05	3.51E-05	1.00E-04	N	0.85747	8.58E-08	-	21.75	0%
Ethyl ether	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	60	0%
Hexachlorobenzene	3.66E-09	0	3.66E-09	C	0.04854	-	1.78E-10	0.002	0%
Hexachloroethane	6.49E-05	0	6.49E-05	C	0.04854	-	3.15E-06	0.25	0%

Table 4-10. TAP Concentrations for Organics (continued)

Pollutant	Maximum RCE/ICE & TSA-R CCE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC ($\mu g/m^3$) Limits	% of AAC/AACC
	(lb/hr)	(lb/hr)	(lb/hr)		(μg/m3 per lb/hr)	mg/m3	μg/m3		
Isobutanol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	6	0%
Isooctane (2,2,4-Trimethyl pentane)	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	17.5	0%
Isopropanol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	49	0%
Methane	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
Methanol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	13	0%
Methylene chloride	6.49E-05	0	6.49E-05	C	0.04854	-	3.15E-06	0.24	0%
Methyl isobutyl ketone	4.55E-09	0	4.55E-09	N	0.85747	3.90E-12	-	10.25	0%
Organophosphates	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
Pentachlorophenol	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	0.025	0%
Polystyrene	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
Pyridine	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	0.75	0%
1,1,2,2-Tetrachloroethane	6.49E-10	0	6.49E-10	C	0.04854	-	3.15E-11	0.017	0%
Tetrachloroethylene	6.49E-05	0	6.49E-05	C	0.04854	-	3.15E-06	2.1	0%
Toluene	6.49E-05	1.36E-04	2.01E-04	N	0.85747	1.72E-07	-	18.75	0%
1,1,1-Trichloroethane (methyl chloroform)	1.49E-04	0	1.49E-04	N	0.85747	1.28E-07	-	95.5	0%
Trichloroethylene	6.49E-05	0	6.49E-05	C	0.04854	-	3.15E-06	0.77	0%
Trichlorofluoromethane	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
Varsol	6.49E-05	0	6.49E-05	NA	NA	NA	NA	NA	NA
Xylene	6.49E-05	1.01E-04	1.66E-04	N	0.85747	1.42E-07	-	21.75	0%
Cyclohexane	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	52.5	0%
Nitrobenzene	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	0.25	0%
Mercury	6.49E-05	0	6.49E-05	N	0.85747	5.57E-08	-	0.005	0%
PAHs (excluding Naphthalene)	0	4.18E-07	4.18E-07	C	0.04854	-	2.03E-08	1.40E-02	0%
Naphthalene	0	1.25E-06	1.25E-06	N	0.85747	1.08E-09	-	3.33	0%
Acetaldehyde	0	1.59E-05	1.59E-05	C	0.04854	-	7.71E-07	4.50E-01	0%

Table 4-10. TAP Concentrations for Organics (continued)

Pollutant	Maximum RCE/ICE & TSA-R CCE Emission Rate[a]	Emission Rate from Propane Heaters[b]	Total Emissions	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC (μg/m^3) Limits	% of AAC/AACC
	(lb/hr)	(lb/hr)	(lb/hr)		(μg/m3 per lb/hr)	mg/m3	μg/m3		
Acrolein	0	1.00E-05	1.00E-05	N	0.85747	8.60E-09	-	0.0125	0%
Formaldehyde	0	6.31E-05	6.31E-05	C	0.04854	-	3.06E-06	7.70E-02	0%
Hexane	0	2.34E-05	2.34E-05	N	0.85747	2.01E-08	-	9	0%
Ammonia	0	1.25E-02	1.25E-02	N	0.85747	1.08E-05	-	0.9	0%

a. Maximum RCE and TSA-R CCE emission rates for all activities. See Table 4-3.

b. Heater emissions rates for organics provided in Table 4-6.

c. N = Non-carcinogen TAP per IDAPA 58.01.01.585. C = Carcinogen TAP per IDAPA 58.01.01.586. NA = Not regulated per IDAPA 58.01.01.585, 58.01.01.586, or 58.01.01.006.

d. Dispersion coefficient determined with a regulatory compliant AER~~SCREEN~~MOD air dispersion ~~screening~~ model. ~~The value for non-carcinogens, 10.65 micrograms/m^3 per lb/hr represents the 24-hour scaling maximum, and the value for carcinogens, 1.776 micrograms/m^3 per lb/hr represents the annual scaling maximum.~~

e. Calculated AAC (mg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (μg/m3 per lb/hr) x (1 mg/1000 μg).

f. Calculated AACC (μg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (μg/m3 per lb/hr).

~~**Table 4-11. TAP Concentrations for Inorganics**~~

~~Pollutant~~	~~Maximum RCE/ICE Emission Rate (Unabated)[a,b]~~	~~Type[c]~~	~~Dispersion Coefficient[d]~~	~~Calculated AAC[e]~~	~~Calculated AACC[f]~~	~~AAC(mg/m³) AACC (µg/m³) Limits~~	~~% of AAC/AACC~~
-	~~(lb/hr)~~	-	~~(µg/m3 per lb/hr)~~	~~mg/m3~~	~~µg/m3~~	-	-
~~Aluminum = Al~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.5~~	~~0%~~
~~Aluminum Oxide = Al2O3~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.5~~	~~0%~~
~~Arsenic~~	~~6.10E-05~~	~~C~~	~~1.776~~	-	~~1.08E-04~~	~~0.00023~~	~~47%~~
~~Barium~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.025~~	~~0%~~
~~Beryllium~~	~~7.09E-05~~	~~C~~	~~1.776~~	-	~~1.26E-04~~	~~0.0042~~	~~3%~~
~~Cadmium~~	~~7.09E-05~~	~~C~~	~~1.776~~	-	~~1.26E-04~~	~~0.00056~~	~~22%~~
~~Calcium~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Chromium~~	~~1.70E-05~~	~~C~~	~~1.776~~	-	~~3.02E-05~~	~~0.000083~~	~~36%~~
~~Copper = Cu~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.067~~	~~0%~~
~~Iron = Fe~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Lead~~	~~1.77E-03~~	~~S~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Lithium = Li~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Magnesium~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Nickel~~	~~7.09E-05~~	~~C~~	~~1.776~~	-	~~1.26E-04~~	~~0.0042~~	~~3%~~
~~Platinum = Pt~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.05~~	~~0%~~
~~Selenium~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.01~~	~~0%~~
~~Silver~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.005~~	~~0%~~
~~Stainless steel~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Tantalum = Ta~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.25~~	~~0%~~
~~Tungsten = W~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.25~~	~~0%~~
~~Uranium Metal~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.01~~	~~0%~~
~~Zinc~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.5~~	~~0%~~
~~Asbestos~~	~~7.09E-07~~	~~C&S~~	~~1.776~~	~~NA~~	~~1.26E-06~~	~~0.000004~~	~~31%~~
~~Benelex~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Calcium Chloride = CaCl2~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Calcium Silicate (Microcel E) = Ca2SiO4~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.5~~	~~0%~~
~~Cyanide~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.25~~	~~0%~~
~~2,4-Dinitrotoluene~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.05~~	~~0%~~
~~Graphite~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Iron Oxide = Fe2O~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.25~~	~~0%~~
~~Magnesia Cement~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Magnesium Oxide = MgO = Periclase~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.5~~	~~0%~~
~~Magnesium Sulfate = MgSO4~~	~~7.09E-05~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Nitrate~~	~~3.40E-04~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~Nitric Acid = HNO3~~	~~7.09E-05~~	~~N~~	~~10.65~~	~~7.55E-07~~	-	~~0.25~~	~~0%~~

Table 4-11. TAP Concentrations for Inorganics (continued)

Pollutant	Maximum RCE/ICE Emission Rate (Unabated)[a,b]	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC (µg/m^3) Limits	% of AAC/AACC
-	(lb/hr)	-	(µg/m3 per lb/hr)	mg/m3	µg/m3	-	-
Polychlorinated biphenyls (PCBs)	1.06E-03	C	1.776	-	1.89E-03	0.01	19%
Portland Cement	7.09E-05	N	10.65	7.55E-07	-	0.5	0%
Potassium Nitrate = Saltpeter = K2(NO3)	7.09E-05	NA	NA	NA	NA	NA	NA
Silicon Oxide = SiOx	7.09E-05	NA	NA	NA	NA	NA	NA
Sodium Hydroxide = NaOH = Caustic soda = Lye	7.09E-05	N	10.65	7.55E-07	-	0.1	0%
Sodium Nitrate = NaNO3	7.09E-05	NA	NA	NA	NA	NA	NA
Sulfamic/nitric acid	7.09E-05	NA	NA	NA	NA	NA	NA

a. Maximum RCE/ICE emission rates for all activities. See Table 4-3.

b. Emissions do not account for the use of HEPA filters.

c. N = Non-carcinogen TAP per IDAPA 58.01.01.585. C = Carcinogen TAP per IDAPA 58.01.01.586. S = Significant pollutant per IDAPA 58.01.01.006. NA = Not regulated per IDAPA 58.01.01.585, 58.01.01.586, or 58.01.01.006.

d. Dispersion coefficient determined with a regulatory compliant AERSCREEN air dispersion screening model. The value for non-carcinogens, 10.65 micrograms/m3 per lb/hr represents the 24-hour scaling maximum, and the value for carcinogens, 1.776 micrograms/m3 per lb/hr represents the annual scaling maximum.

e. Calculated AAC (mg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr) x (1 mg/1000 µg).

f. Calculated AACC (µg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr).

Table 4-11. TAP Concentrations for Inorganics

Pollutant	Maximum RCE & CCE Emission Rate (Unabated)[a, b]	Total Emission Rate (Abated)	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m³) AACC (µg/m³) Limits	% of AAC/AACC
	(lb/hr)	(lb/hr)		(µg/m3 per lb/hr)	mg/m3	µg/m3		
Aluminum = Al	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.5	0%
Aluminum Oxide = Al2O3	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.5	0%
Arsenic	1.61E-04	1.59E-10	C	0.04854	-	7.80E-06	0.00023	3%
Barium	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.025	0%
Beryllium	1.87E-04	1.85E-10	C	0.04854	-	9.07E-06	0.0042	0%
Cadmium	1.87E-04	1.85E-10	C	0.04854	-	9.07E-06	0.00056	2%
Calcium	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Chromium	4.48E-05	4.44E-11	C	0.04854	-	2.18E-06	0.000083	3%
Copper = Cu	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.067	0%
Iron = Fe	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Lead	4.67E-03	4.62E-09	S	NA	NA	NA	NA	NA
Lithium = Li	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Magnesium	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Nickel	1.87E-04	1.85E-10	C	0.04854	-	9.07E-06	0.0042	0%
Platinum = Pt	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.05	0%
Selenium	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.01	0%
Silver	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.005	0%
Stainless steel	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Tantalum = Ta	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.25	0%
Tungsten = W	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.25	0%
Uranium Metal	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.01	0%
Zinc	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.5	0%
Asbestos	8.41E-03	8.32E-09	S	NA	NA	NA	NA	NA
Benelex	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Calcium Chloride = CaCl2	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Calcium Silicate (Microcel E) = Ca2SiO4	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.5	0%
Cyanide	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.25	0%
2,4-Dinitrotoluene	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.05	0%
Graphite	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Iron Oxide = Fe2O	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.25	0%

Magnesia Cement	*1.87E-04*	*1.85E-10*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Magnesium Oxide = MgO = Periclase	*1.87E-04*	*1.85E-10*	*N*	*0.85747*	*1.60E-07*	*-*	*0.5*	*0%*
Magnesium Sulfate = MgSO4	*1.87E-04*	*1.85E-10*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitrate	*8.97E-04*	*8.87E-10*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nitric Acid = HNO3	*1.87E-04*	*1.85E-10*	*N*	*0.85747*	*1.60E-07*	*-*	*0.25*	*0%*

Table 4-11. TAP Concentrations for Inorganics (continued)

Pollutant	Maximum RCE & CCE Emission Rate (Unabated)[a,b]	Total Emission Rate (Abated)	Type[c]	Dispersion Coefficient[d]	Calculated AAC[e]	Calculated AACC[f]	AAC(mg/m^3) AACC (µg/m^3) Limits	% of AAC/AACC
	(lb/hr)	(lb/hr)		(µg/m3 per lb/hr)	mg/m3	µg/m3		
Polychlorinated biphenyls (PCBs)	2.80E-03	2.77E-09	C	0.04854	-	1.36E-04	0.01	1%
Portland Cement	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.5	0%
Potassium Nitrate = Saltpeter = K2(NO3)	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Silicon Oxide = SiOx	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Sodium Hydroxide = NaOH = Caustic soda = Lye	1.87E-04	1.85E-10	N	0.85747	1.60E-07	-	0.1	0%
Sodium Nitrate = NaNO3	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA
Sulfamic/nitric acid	1.87E-04	1.85E-10	NA	NA	NA	NA	NA	NA

a. Maximum RCE emission rates for all activities. See Table 4-3.
b. Emissions do not account for the use of HEPA filters.
c. N = Non-carcinogen TAP per IDAPA 58.01.01.585. C = Carcinogen TAP per IDAPA 58.01.01.586. S = Significant pollutant per IDAPA 58.01.01.006. NA = Not regulated per IDAPA 58.01.01.585, 58.01.01.586, or 58.01.01.006.
d. Dispersion coefficients determined with a regulatory compliant AERMOD air dispersion model.
e. Calculated AAC (mg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr) x (1 mg/1000 µg).
f. Calculated AACC (µg/m3) = Total Emissions Unabated (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr).

Table 4-12. National Ambient Air Quality Standards Analysis

Pollutant (units vary, see below)	CO (8-hr)	CO (1-hr)	Lead[a] (quarter)	NO_2 (annual)	NO_2 (1-hr)	Ozone (1-hr)[b]	PM_{10} (24-hr)	$PM_{2.5}$ (annual)	$PM_{2.5}$ (24-hr)[b]	SO_2 (annual)	SO_2 (24-hr)	SO_2 (3-hr)	SO_2 (1-hr)
RCE/ Stack Emissions[c]	NA	NA	3.03E-10	NA	NA	5.20E-02	9.65E-09	9.65E-09	9.65E-09	NA	NA	NA	NA
RCE Stack Disp. Coeff.d	NA	NA	10.65	NA	NA	17.76	10.65	1.776	10.65	NA	NA	NA	NA
RCE Stack Ambient Conc'n.[e]	NA	NA	3.23E-09	NA	NA	9.24E-01	1.03E-07	1.71E-08	1.03E-07	NA	NA	NA	NA
Heater Emissions[f]	1.29E-01	1.29E-01	NA	1.53E-01	1.53E-01	8.42E-03	1.16E-02	1.16E-02	1.16E-02	6.27E-02	6.27E-02	6.27E-02	6.27E-02
Heater Disp. Coeff.[d]	15.98	17.76	NA	1.776	17.76	17.76	10.65	1.776	10.65	1.776	10.65	17.76	17.76
Heater Amb. Conc'n.[e]	2.05E+00	2.28E+00	NA	2.72E-01	2.72E+00	1.49E-01	1.24E-01	2.07E-02	1.24E-01	1.11E-01	6.68E-01	1.11E+00	1.11E+00
Engine Emissions[g]	1.25E+00	1.25E+00	NA	7.64E+00	7.64E+00	4.16E-01	2.05E-01	5.13E-02	5.13E-02	1.06E+00	1.06E+00	1.06E+00	1.06E+00
Engine Disp. Coeff.[d]	15.98	17.76	NA	1.776	17.76	17.76	10.65	1.776	10.65	1.776	10.65	17.76	17.760
Engine Ambient Conc'n.[e]	2.00E+01	2.22E+01	NA	1.36E+01	1.36E+02	7.40E+00	2.18E+00	9.11E-02	5.46E-01	1.88E+00	1.13E+01	1.88E+01	1.88E+01
Max. RCE Ambient Conc'n. (w. mob. equip.)	2.20E+01	2.45E+01	3.23E-09	1.38E+01	1.38E+02	8.47E+00	2.31E+00	1.12E-01	6.70E-01	2.00E+00	1.20E+01	2.00E+01	2.00E+01
Max. RCE Ambient Conc'n. (w.o. mob. equip.)	2.05E+00	2.28E+00	3.23E-09	2.72E-01	2.72E+00	1.07E+00	1.24E-01	2.07E-02	1.24E-01	1.11E-01	6.68E-01	1.11E+00	1.11E+00
Significant Contribution Levels	500	2000	NA	1.0	7.5	NA	5.0	0.3	1.2	1.0	5.0	25	7.8
% of SCLs (w. mob. equip.)[h]	4%	1%	NA	1383%	1844%	NA	46%	37%	56%	200%	239%	80%	256%
% of SCLs (w.o. mob. equip.)[h]	0%	0%	NA	27%	36%	NA	2%	7%	10%	11%	13%	4%	[illegible]
ID Background Ambient Conc'n.[i]	2.30E+03	3.60E+03	3.00E-02	1.70E+01	9.22E+01	0.00E+00	7.30E+01	7.80E+00	2.76E+01	8.00E+00	2.60E+01	3.40E+01	1.08E+02
Combined Ambient Conc'n. (w. mob. equip.)[h,j]	2.32E+03	3.62E+03	3.00E-02	3.08E+01	2.31E+02	8.47E+00	7.53E+01	7.91E+00	2.83E+01	1.00E+01	3.80E+01	5.40E+01	1.28E+02
Combined Ambient Conc'n. (w.o. mob. equip.)[h,j]	2.30E+03	3.60E+03	3.00E-02	1.73E+01	9.49E+01	1.07E+00	7.31E+01	7.82E+00	2.77E+01	8.11E+00	2.67E+01	3.51E+01	1.09E+02
Sect. 577 NAAQS Regulatory Limits (µg/m3)[i]	10000	40000	1.5	100	188.7	235	150	15.0	35.0	80	365	1300	195.5
% of Regulatory Limit (w. mob. equip.)[h,k]	23%	9%	2%	31%	122%	4%	50%	53%	81%	12%	10%	4%	65%
% of Regulatory Limit (w.o. mob. equip.)[h,k]	23%	9%	2%	17%	50%	0%	49%	52%	79%	10%	7%	3%	56%

UNITS *Emissions:* lb/hr *Dispersion coefficients:* (µg/m³)/(lb/hr) *Concentrations:* µg/m³

a.

b.

c. RCE stack emissions consist of the process emissions from Table 4-3.

d. See Appendix E for a discussion of the air dispersion model and methodology used to determine the dispersion coefficients.

e. Ambient concentrations (µg/m3) = Emission Rate (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr). Ambient concentrations are a maximum impact, as determined by the air dispersion model. See Appendix E.

f. Heater emissions obtained from Table 4-5.

g. Engine emissions obtained from Table 4-8.

~~h. Mobile fuel burning equipment, which includes the Engine emissions provided in this table, are not required for inclusion in the regulatory comparisons. The maximum ambient concentrations that are shown to include mobile equipment [e.g. rows containing "(w. mob. eq.)" in the description] are provided for reference only. Compliance is demonstrated for regulatory comparison of ambient concentrations that do not include mobile equipment [e.g. rows containing "(w.o. mob. eq.)" in the description].~~

~~i. Statewide background ambient concentrations for criteria pollutants were obtained from the State of Idaho DEQ, no information was available for Ozone (VOCs).~~

~~j. Combined ambient concentrations were obtained by adding the Max. RCE ambient concentrations to the Statewide background ambient concentrations.~~

~~k. Combined ambient concentrations, Section 477 NAAQS Regulatory Limits, and percentage comparisons are shown for reference only. Ambient concentrations are below Significant Contribution Levels.~~

Table 4-12. National Ambient Air Quality Standards Analysis

Pollutant (units vary, see below)	CO (8-hr)	CO (1-hr)	Lead[a] (quarter)	NO_2 (annual)	NO_2 (1-hr)	Ozone (1-hr)[b]	PM_{10} (24-hr)	$PM_{2.5}$ (annual)	$PM_{2.5}$ (24-hr)[b]	SO_2 (annual)	SO_2 (24-hr)	SO_2 (3-hr)	SO_2 (1-hr)
RCE/ Stack Emissions[c]	NA	NA	4.62E-09	NA	NA	2.84E-02	8.53E-08	8.53E-08	2.13E-08	NA	NA	NA	NA
RCE Stack Disp. Coeff.[d]	NA	NA	0.09535	NA	NA	17.79989	0.51924	0.04854	0.57082	NA	NA	NA	NA
RCE Stack Ambient Conc'n.[e]	NA	NA	4.41E-10	NA	NA	5.06E-01	4.43E-08	4.14E-09	1.22E-08	NA	NA	NA	NA
Heater Emissions[f]	1.29E-01	1.29E-01	NA	1.53E-01	1.53E-01	8.42E-03	1.16E-02	1.16E-02	1.16E-02	6.27E-02	6.27E-02	6.27E-02	6.27E-02
Heater Disp. Coeff.[d]	2.30348	14.31434	NA	0.05407	8.48173	17.79989	0.51924	0.04854	0.57082	0.05407	0.85747	5.95845	11.63921
Heater Amb. Conc'n.[e]	2.97E-01	1.85E+00	NA	8.27E-03	1.30E+00	1.50E-01	6.02E-03	5.63E-04	6.62E-03	3.39E-03	5.38E-02	3.74E-01	7.30E-01
Engine Emissions[g]	1.38E+00	1.38E+00	NA	9.54E+00	9.54E+00	4.57E-01	2.28E-01	2.28E-02	5.70E-02	1.34E+00	1.34E+00	1.34E+00	1.34E+00
Engine Disp. Coeff.[d]	2.30348	14.31434	NA	0.05407	8.48173	17.79989	0.51924	0.04854	0.57082	0.05407	0.85747	5.95845	11.63921
Engine Ambient Conc'n.[e]	3.18E+00	1.98E+01	NA	5.16E-01	8.09E+01	8.13E+00	1.18E-01	1.11E-03	3.25E-02	7.25E-02	1.15E+00	7.98E+00	1.56E+01
Max. RCE Ambient Conc'n. (w. mob. equip.)	3.48E+00	2.16E+01	4.41E-10	5.24E-01	8.22E+01	8.79E+00	1.24E-01	1.67E-03	3.92E-02	7.58E-02	1.20E+00	8.36E+00	1.63E+01
Max. RCE Ambient Conc'n. (w.o. mob. equip.)	2.97E-01	1.85E+00	4.41E-10	8.27E-03	1.30E+00	6.55E-01	6.02E-03	5.63E-04	6.62E-03	3.39E-03	5.38E-02	3.74E-01	7.30E-01
Significant Contribution Levels	500	2000	NA	1	7.5	NA	5	0.3	1.2	1	5	25	7.8
% of SCLs (w. mob. equip.)[h]	1%	1%	NA	52%	1096%	NA	2%	1%	3%	8%	24%	33%	209%
% of SCLs (w.o. mob. equip.)[h]	0%	0%	NA	1%	17%	NA	0%	0%	1%	0%	1%	1%	9%
ID Background Ambient Conc'n.[i]	2.30E+03	3.60E+03	3.00E-02	1.70E+01	9.22E+01	0.00E+00	7.30E+01	7.80E+00	2.76E+01	8.00E+00	2.60E+01	3.40E+01	1.08E+02
Combined Ambient Conc'n. (w. mob. equip.)[h,j]	2.30E+03	3.62E+03	3.00E-02	1.75E+01	1.74E+02	8.79E+00	7.31E+01	7.80E+00	2.76E+01	8.08E+00	2.72E+01	4.24E+01	1.24E+02
Combined Ambient Conc'n. (w.o. mob. equip.)[h,j]	2.30E+03	3.60E+03	3.00E-02	1.70E+01	9.35E+01	6.55E-01	7.30E+01	7.80E+00	2.76E+01	8.00E+00	2.61E+01	3.44E+01	1.09E+02
Sect. 577 NAAQS Regulatory Limits (µg/m3)[l]	10000	40000	1.5	100	188.7	235	150	15	35	80	365	1300	195.5
% of Regulatory Limit (w. mob. equip.)[h,k]	23%	9%	2%	18%	92%	4%	49%	52%	79%	10%	7%	3%	64%
% of Regulatory Limit (w.o. mob. equip.)[h,k]	23%	9%	2%	17%	50%	0%	49%	52%	79%	10%	7%	3%	56%

UNITS *Emissions:* lb/hr **Dispersion coefficients:** $(\mu g/m^3)/(lb/hr)$ **Concentrations:** $\mu g/m^3$

a. A conservative 24-hr dispersion coefficient was used for lead since quarterly averages are not provided by the model.

b. For RCE/ICE stack emissions and Engine Emissions, a PM-2.5/PM-10 ratio of 0.25 was used for determining the amount of PM-2.5 emitted. This value was determined from particle size mulitpliers for paved roads, which is provided in Table 13.2.1-1 of AP-42, Emission Factors. PM emissions (exhaust, brake wear, tire wear) from vehicles on paved roads emits more PM that the operations performed in the RCE/ICE or diesel burning equipment associated with the RCE/ICE. Therefore, a PM-2.5/PM-10 ratio of 0.25 is considered to be conservative. A PM-2.5/PM-10 ratio was not applied to propane heater emissions, as PM-2.5 was calculated as part of the heater emissions. See Table 4-5.

c. RCE stack emissions consist of the process emissions from Table 4-3.
d. See Appendix E for a discussion of the air dispersion model and methodology used to determine the dispersion coefficients.
e. Ambient concentrations (µg/m3) = Emission Rate (lb/hr) x Dispersion Coefficient (µg/m3 per lb/hr). Ambient concentrations are a maximum impact, as determined by the air dispersion model. See Appendix E.
f. Heater emissions obtained from Table 4-5.
g. Engine emissions obtained from Table 4-8.
h. Mobile fuel burning equipment, which includes the Engine emissions provided in this table, are not required for inclusion in the regulatory comparisons. The maximum ambient concentrations that are shown to include mobile equipment [e.g. rows containing "(w. mob. eq.)" in the description] are provided for reference only. Compliance is demonstrated for regulatory comparison of ambient concentrations that do not include mobile equipment [e.g. rows containing "(w.o. mob. eq.)" in the description].
i. Statewide background ambient concentrations for criteria pollutants were obtained from the State of Idaho DEQ, no information was available for Ozone (VOCs).
j. Combined ambient concentrations were obtained by adding the Max. RCE ambient concentrations to the Statewide background ambient concentrations.
k. Combined ambient concentrations, Section 477 NAAQS Regulatory Limits, and percentage comparisons are shown for reference only. Ambient concentrations are below Significant Contribution Levels.

Table 4-13. RCE/ICE Annual Emissions Summary

Pollutant	Retrieval Operations (ton/yr)	Engines/ Heater (ton/yr)	Total (ton/yr)
Total "VOCs"	5.20E-02	5.67E-02	1.09E-01
Acetone	5.20E-04	0	5.20E-04
Benzene	5.20E-04	1.30E-04	6.50E-04
Butanol, n-	5.20E-04	0	5.20E-04
2-Butanone (Methyl ethyl ketone)	5.20E-04	0	5.20E-04
Carbon disulfide	5.20E-04	0	5.20E-04
Carbon tetrachloride	4.06E-04	0	4.06E-04
Chlorobenzene	2.60E-08	0	2.60E-08
Chloroform	5.20E-04	0	5.20E-04
Cresols (m, p & o)	5.20E-04	0	5.20E-04
1,2-Dichlorobenzene (o-Dichlorobenzene)	5.20E-04	0	5.20E-04
1,4-Dichlorobenzene	5.20E-04	0	5.20E-04
Dichloroethane, 1,1- = (Ethylene dichloride)	5.20E-04	0	5.20E-04
1,2-Dichloroethane	1.18E-06	0	1.18E-06
Dichloroethylene (-1,1)	5.20E-06	0	5.20E-06
cis-1,2-Dichloroethylene	5.20E-04	0	5.20E-04
1,2-Dichloropropane (Propylene dichloride)	5.20E-04	0	5.20E-04
Divinylbenzene	5.20E-04	0	5.20E-04
Ethanol	5.20E-04	0	5.20E-04
2-Ethoxyethanol	5.20E-04	0	5.20E-04
Ethyl benzene	5.20E-04	1.54E-04	6.74E-04
Ethyl ether	5.20E-04	0	5.20E-04
Hexachlorobenzene	2.93E-08	0	2.93E-08
Hexachloroethane	5.20E-04	0	5.20E-04
Isobutanol	5.20E-04	0	5.20E-04
Isooctane (2,2,4-Trimethyl pentane)	5.20E-04	0	5.20E-04
Isopropanol	5.20E-04	0	5.20E-04
Methane[a]	5.20E-04	0	5.20E-04
Methanol	5.20E-04	0	5.20E-04
Methylene chloride	5.20E-04	0	5.20E-04
Methyl isobutyl ketone	3.64E-08	0	3.64E-08
Organophosphates[a]	5.20E-04	0	5.20E-04
Pentachlorophenol	5.20E-04	0	5.20E-04
Polystyrene[a]	5.20E-04	0	5.20E-04
Pyridine	5.20E-04	0	5.20E-04
1,1,2,2-Tetrachloroethane	5.20E-09	0	5.20E-09
Tetrachloroethylene	5.20E-04	0	5.20E-04
Toluene	5.20E-04	5.95E-04	1.12E-03
1,1,1-Trichloroethane (methyl chloroform)	1.20E-03	0	1.20E-03
Trichloroethylene	5.20E-04	0	5.20E-04
Trichlorofluoromethane[a]	5.20E-04	0	5.20E-04
1,1,2-Trichloro-1,2,2-trifluoroethane[a]	5.20E-04	0	5.20E-04
Varsol[a]	5.20E-04	0	5.20E-04
Xylene	5.20E-04	4.41E-04	9.61E-04

Table 4-13. RCE/ICE Annual Emissions Summary (continued)

Pollutant	Retrieval Operations (ton/yr)	Engines/ Heater (ton/yr)	Total (ton/yr)
Cyclohexane	5.20E-04	0	5.20E-04
Nitrobenzene	5.20E-04	0	5.20E-04
Mercury	5.20E-04	0	5.20E-04
PAHs (excluding Naphthalene)	0	1.83E-06	1.83E-06
Naphthalene	0	5.49E-06	5.49E-06
Acetaldehyde	0	6.96E-05	6.96E-05
Acrolein	0	4.39E-05	4.39E-05
Formaldehyde	0	2.76E-04	2.76E-04
Hexane	0	1.03E-04	1.03E-04
Ammonia	0	5.49E-02	5.49E-02
Total PM	**5.31E-09**	**9.22E-01**	**9.22E-01**
Aluminum = Al	5.31E-11	0	5.31E-11
Aluminum Oxide = Al2O3	5.31E-11	0	5.31E-11
Arsenic	4.57E-11	0	4.57E-11
Barium	5.31E-11	0	5.31E-11
Beryllium	5.31E-11	0	5.31E-11
Cadmium	5.31E-11	0	5.31E-11
Calcium[a]	5.31E-11	0	5.31E-11
Chromium	1.28E-11	0	1.28E-11
Copper = Cu	5.31E-11	0	5.31E-11
Iron = Fe[a]	5.31E-11	0	5.31E-11
Lead	1.33E-09	0	1.33E-09
Lithium[a]	5.31E-11	0	5.31E-11
Magnesium[a]	5.31E-11	0	5.31E-11
Nickel	5.31E-11	0	5.31E-11
Platinum = Pt	5.31E-11	0	5.31E-11
Selenium	5.31E-11	0	5.31E-11
Silver	5.31E-11	0	5.31E-11
Stainless steel[a]	5.31E-11	0	5.31E-11
Tantalum = Ta	5.31E-11	0	5.31E-11
Tungsten = W	5.31E-11	0	5.31E-11
Uranium Metal	5.31E-11	0	5.31E-11
Zinc	5.31E-11	0	5.31E-11
Asbestos	5.31E-13	0	5.31E-13
Benelex[a]	5.31E-11	0	5.31E-11
Calcium Chloride[a]	5.31E-11	0	5.31E-11
Calcium Silicate (Microcel E) = Ca2SiO4	5.31E-11	0	5.31E-11
Cyanide	5.31E-11	0	5.31E-11
2,4-Dinitrotoluene[a]	5.31E-11	0	5.31E-11
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	5.31E-11	0	5.31E-11
Graphite[a]	5.31E-11	0	5.31E-11
Iron Oxide = Fe2O	5.31E-11	0	5.31E-11
Magnesia Cement[a]	5.31E-11	0	5.31E-11
Magnesium Oxide = MgO = Periclase	5.31E-11	0	5.31E-11

~~**Table 4-13. RCE/ICE Annual Emissions Summary (continued)**~~

~~Pollutant~~	~~Retrieval Operations (ton/yr)~~	~~Engines/ Heater (ton/yr)~~	~~Total (ton/yr)~~
~~Magnesium Sulfate~~[a]	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Nitrate~~[a]	~~2.55E-10~~	~~0~~	~~2.55E-10~~
~~Nitric Acid = HNO3~~	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Polychlorinated biphenyls (PCBs)~~	~~7.97E-10~~	~~0~~	~~7.97E-10~~
~~Portland Cement~~	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Potassium Nitrate~~[a]	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Silicon Oxide~~[a]	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Sodium Hydroxide = NaOH = Caustic soda = Lye~~	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Sodium Nitrate~~[a]	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~Sulfamic/Nitric Acid~~[a]	~~5.31E-11~~	~~0~~	~~5.31E-11~~
~~a. Pollutant not regulated by IDAPA 58.01.01, "Rules for the Control of Air Pollution in Idaho."~~			

Table 4-13. RCE/ICE and TSA-R CCE Annual Emissions Summary

Pollutant	Retrieval Operations (ton/yr)	Engines/ Heater (ton/yr)	Total (ton/yr)
Total "VOCs"	**2.84E-02**	**5.67E-02**	**8.52E-02**
Acetone	2.84E-04	0	2.84E-04
Benzene	2.84E-04	1.30E-04	4.14E-04
Butanol, n-	2.84E-04	0	2.84E-04
2-Butanone (Methyl ethyl ketone)	2.84E-04	0	2.84E-04
Carbon disulfide	2.84E-04	0	2.84E-04
Carbon tetrachloride	2.22E-04	0	2.22E-04
Chlorobenzene	1.42E-08	0	1.42E-08
Chloroform	2.84E-04	0	2.84E-04
Cresols (m, p & o)	2.84E-04	0	2.84E-04
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.84E-04	0	2.84E-04
1,4-Dichlorobenzene	2.84E-04	0	2.84E-04
Dichloroethane, 1,1- = (Ethylene dichloride)	2.84E-04	0	2.84E-04
1,2-Dichloroethane	6.43E-07	0	6.43E-07
Dichloroethylene (-1,1)	2.84E-06	0	2.84E-06
cis-1,2-Dichloroethylene	2.84E-04	0	2.84E-04
1,2-Dichloropropane (Propylene dichloride)	2.84E-04	0	2.84E-04
Divinylbenzene	2.84E-04	0	2.84E-04
Ethanol	2.84E-04	0	2.84E-04
2-Ethoxyethanol	2.84E-04	0	2.84E-04
Ethyl benzene	2.84E-04	1.54E-04	4.38E-04
Ethyl ether	2.84E-04	0	2.84E-04
Hexachlorobenzene	1.60E-08	0	1.60E-08
Hexachloroethane	2.84E-04	0	2.84E-04
Isobutanol	2.84E-04	0	2.84E-04
Isooctane (2,2,4-Trimethyl pentane)	2.84E-04	0	2.84E-04
Isopropanol	2.84E-04	0	2.84E-04
Methane[a]	2.84E-04	0	2.84E-04
Methanol	2.84E-04	0	2.84E-04
Methylene chloride	2.84E-04	0	2.84E-04
Methyl isobutyl ketone	1.99E-08	0	1.99E-08
Organophosphates[a]	2.84E-04	0	2.84E-04
Pentachlorophenol	2.84E-04	0	2.84E-04
Polystyrene[a]	2.84E-04	0	2.84E-04
Pyridine	2.84E-04	0	2.84E-04
1,1,2,2-Tetrachloroethane	2.84E-09	0	2.84E-09
Tetrachloroethylene	2.84E-04	0	2.84E-04
Toluene	2.84E-04	5.95E-04	8.79E-04
1,1,1-Trichloroethane (methyl chloroform)	6.54E-04	0	6.54E-04
Trichloroethylene	2.84E-04	0	2.84E-04
Trichlorofluoromethane[a]	2.84E-04	0	2.84E-04
1,1,2-Trichloro-1,2,2-trifluoroethane[a]	2.84E-04	0	2.84E-04
Varsol[a]	2.84E-04	0	2.84E-04
Xylene	2.84E-04	4.41E-04	7.26E-04

Table 4-13. RCE/ICE and TSA-R CCE Annual Emissions Summary (continued)

Pollutant	Retrieval Operations (ton/yr)	Engines/ Heater (ton/yr)	Total (ton/yr)
Cyclohexane	2.84E-04	0	2.84E-04
Nitrobenzene	2.84E-04	0	2.84E-04
Mercury	2.84E-04	0	2.84E-04
PAHs (excluding Naphthalene)	0	1.83E-06	1.83E-06
Naphthalene	0	5.49E-06	5.49E-06
Acetaldehyde	0	6.96E-05	6.96E-05
Acrolein	0	4.39E-05	4.39E-05
Formaldehyde	0	2.76E-04	2.76E-04
Hexane	0	1.03E-04	1.03E-04
Ammonia	0	5.49E-02	5.49E-02
Total PM	**8.09E-08**	**9.22E-01**	**9.22E-01**
Aluminum = Al	8.09E-10	0	8.09E-10
Aluminum Oxide = Al2O3	8.09E-10	0	8.09E-10
Arsenic	6.96E-10	0	6.96E-10
Barium	8.09E-10	0	8.09E-10
Beryllium	8.09E-10	0	8.09E-10
Cadmium	8.09E-10	0	8.09E-10
Calcium[a]	8.09E-10	0	8.09E-10
Chromium	1.94E-10	0	1.94E-10
Copper = Cu	8.09E-10	0	8.09E-10
Iron = Fe[a]	8.09E-10	0	8.09E-10
Lead	2.02E-08	0	2.02E-08
Lithium[a]	8.09E-10	0	8.09E-10
Magnesium[a]	8.09E-10	0	8.09E-10
Nickel	8.09E-10	0	8.09E-10
Platinum = Pt	8.09E-10	0	8.09E-10
Selenium	8.09E-10	0	8.09E-10
Silver	8.09E-10	0	8.09E-10
Stainless steel[a]	8.09E-10	0	8.09E-10
Tantalum = Ta	8.09E-10	0	8.09E-10
Tungsten = W	8.09E-10	0	8.09E-10
Uranium Metal	8.09E-10	0	8.09E-10
Zinc	8.09E-10	0	8.09E-10
Asbestos	3.64E-08	0	3.64E-08
Benelex[a]	8.09E-10	0	8.09E-10
Calcium Chloride[a]	8.09E-10	0	8.09E-10
Calcium Silicate (Microcel E) = Ca2SiO4	8.09E-10	0	8.09E-10
Cyanide	8.09E-10	0	8.09E-10
2,4-Dinitrotoluene[a]	8.09E-10	0	8.09E-10
Ferric Sulfate = Fe2(SO4)3xH2O = Iron Persulfate	8.09E-10	0	8.09E-10
Graphite[a]	8.09E-10	0	8.09E-10
Iron Oxide = Fe2O	8.09E-10	0	8.09E-10
Magnesia Cement[a]	8.09E-10	0	8.09E-10
Magnesium Oxide = MgO = Periclase	8.09E-10	0	8.09E-10

Table 4-13. RCE/ICE and TSA-R CCE Annual Emissions Summary (continued)

Pollutant	Retrieval Operations (ton/yr)	Engines/ Heater (ton/yr)	Total (ton/yr)
Magnesium Sulfate[a]	8.09E-10	0	8.09E-10
Nitrate[a]	3.89E-09	0	3.89E-09
Nitric Acid = HNO3	8.09E-10	0	8.09E-10
Polychlorinated biphenyls (PCBs)	1.21E-08	0	1.21E-08
Portland Cement	8.09E-10	0	8.09E-10
Potassium Nitrate[a]	8.09E-10	0	8.09E-10
Silicon Oxide[a]	8.09E-10	0	8.09E-10
Sodium Hydroxide = NaOH = Caustic soda = Lye	8.09E-10	0	8.09E-10
Sodium Nitrate[a]	8.09E-10	0	8.09E-10
Sulfamic/Nitric Acid[a]	8.09E-10	0	8.09E-10
a. Pollutant not regulated by IDAPA 58.01.01, "Rules for the Control of Air Pollution in Idaho."			

5.0 REFERENCES

1. State of Idaho Administrative Procedures Act (IDAPA) 58.01.01, "Rules for the Control of Air Pollution in Idaho."

2. ~~Ravio~~*Raivo*, B. D., G. K. Becker, T. H. Smith, and G. L. Anderson, 1995, Waste Description Information for Transuranic-Contaminated Wastes Stored at the Idaho National Engineering Laboratory, INEL-95/0412, Lockheed Martin Idaho Technologies Company, December 1995.

3. RPT-TRUW-12, AMWTP Waste Stream Designations, Rev. ~~15~~*19*, Advanced Mixed Waste Treatment Project.

4. Code of Federal Regulations, 40 CFR 61, "National Emission Standards for Hazardous Air Pollution."

5. EPA, Office of Air Quality, "*Compilation of Air Pollutant Emission Factors, AP-42,*" Fifth Edition, Vol. I: Stationary Point and Area Sources, January 1995.

6. EPA, 40 CFR 51, Appendix W, "*Guideline on Air Quality Models,*" 1996.

7. *IDEQ, ID AQ 011,* ~~Idaho DEQ, 2002,~~ "*State of Idaho Air Quality Modeling Guideline,*" Idaho Department of Environmental Quality, Air Quality Division, Stationary Source Program, ~~, ID AQ-001~~*Revised* ~~, 12/31/02~~*7/2/11.*

8. EPA, "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources," *Revised, 1992.*

~~9. EPA, "*Beta Release of AERSCREEN User's Guide,*" August 16, 2010.~~

~~10.~~*9.* EPA, EPA-454/B-03-003, "*User's Guide for the AERMOD Terrain Processor (AERMAP),*" October 2004.

~~11.~~*10.* EPA, EPA-454/R-93-038, "*User's Guide to the Building Profile Input Program,*" February 8, 1995.

~~12. Letter from Cheryl A. Robinson, DEQ, to Mr. Timothy J. Safford, U.S. Department of Energy Idaho Operations Office, Subject: "*Facility ID No 023-00001, U.S. Department of Energy, Idaho Operations Office, Idaho Falls RWMC, Storage Area Retrieval Enclosure (TSA-RE) Modeling Protocol Approval for TSA-RE Pad 1, Retrieval Contamination Enclosure (RCE),*" January 25, 2011.~~

~~13. Email from Cheryl Robinson, State of Idaho DEQ, to Christian Maupin, SARACon Inc. Subject: "*INL TSA-RE Pad 1, Retrieval Contamination Enclosure, Modeling Questions,*" March 18, 2011.~~

~~14.~~*11.* Code of Federal Regulations, 40 CFR 52, "Approval and Promulgation of Implementation Plans."

~~15.~~*12.* http://www.aqmd.gov/aer/Updates/SuppInstruforAB2588Facilities.pdf. A website providing emission factors for propane combustion toxics for units < 10 MMBtu/hr. Issued January 2010.

~~16.~~*13.* http://www.sbcapck.org/eng/tech/sulfur01.htm. A website for Santa Barbara Air Pollution Control District, which provides sulfur content information for propane.

~~17.~~*14.* http://www.epa.gov/otaq/certdata.htm. An EPA website that provides certification data from various engine manufacturers for past and current model years.

~~*18.*~~

APPENDIX A. APPLICATION FORM

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Cover Sheet for Air Permit Application – Permit to Construct Form CSPTC

COMPANY NAME, FACILITY NAME, AND FACILITY ID NUMBER

1. Company Name	Idaho Treatment Group, LLC		
2. Facility Name	Transuranic Storage Area – Retrieval Enclosure	3. Facility ID No.	023-00001
4. Brief Project Description - One sentence or less	Operational improvements to Retrieval Contamination Enclosure and addition of TSA-R CCE		

PERMIT APPLICATION TYPE

5. ☐ New Source ☐ New Source at Existing Facility
☐ PTC for a Tier I Source Processed Pursuant to IDAPA 58.01.01.209.05.c ☐ Unpermitted Existing Source
☐ Facility Emissions Cap ☒ Modify Existing Source: Permit No.: P-2011.0109 Date Issued: 9-19-2011
☐ Required by Enforcement Action: Case No.:_____

6. ☒ Minor PTC ☐ Major PTC

FORMS INCLUDED

Included	N/A	Forms		DEQ Verify
☒	☐	Form CSPTC – Cover Sheet		☐
☒	☐	Form GI – Facility Information		☐
☐	☒	Form EU0 – Emissions Units General		☐
☐	☒	Form EU1– Industrial Engine Information	Please specify number of EU1s attached: _____	☐
☐	☒	Form EU2– Nonmetallic Mineral Processing Plants	Please specify number of EU2s attached: _____	☐
☐	☒	Form EU3– Spray Paint Booth Information	Please specify number of EU3s attached: _____	☐
☐	☒	Form EU4– Cooling Tower Information	Please specify number of EU3s attached: _____	☐
☐	☒	Form EU5 – Boiler Information	Please specify number of EU4s attached: _____	☐
☐	☒	Form CBP– Concrete Batch Plant	Please specify number of CBPs attached: _____	☐
☐	☒	Form HMAP – Hot Mix Asphalt Plant	Please specify number of HMAPs attached: _____	☐
☐	☒	PERF – Portable Equipment Relocation Form		☐
☐	☒	Form AO – Afterburner/Oxidizer		☐
☐	☒	Form CA – Carbon Adsorber		☐
☐	☒	Form CYS – Cyclone Separator		☐
☐	☒	Form ESP – Electrostatic Precipitator		☐
☐	☒	Form BCE– Baghouses Control Equipment		☐
☐	☒	Form SCE– Scrubbers Control Equipment		☐
☐	☒	Form VSCE – Venturi Scrubber Control Equipment		☐
☐	☒	Form CAM – Compliance Assurance Monitoring		☐
☐	☒	Forms EI–- Emissions Inventory		☐
☒	☐	PP – Plot Plan		☐
☒	☐	Forms MI1 – MI4 – Modeling	(Excel workbook, all 4 worksheets)	☐
☐	☒	Form FRA – Federal Regulation Applicability		☐

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General Information Form GI
Revision 7
6/29/12

Please see instructions on back page before filling out the form. All information is required. If information is missing, the application will not be processed.

Identification

1. Facility name	Transuranic Storage Area - Retrieval Enclosure
2. Existing facility identification number	023-00001
☐ **Check if new facility (not yet operating)**	
3. Brief project description	Operational improvements to Retrieval Contamination Enclosure and addition of the TSA-R CCE

Facility Information

4. Primary facility permitting contact name	Danny Nichols	**Contact type**	Responsible official
Telephone number	(208) 557-7000	**E-mail**	nichdc@amwtp.inl.gov
5. Alternate facility permitting contact name	Carol R. Anderson	**Alternate contact type**	Facility permitting contact
Telephone number	(208) 557-6773	**E-mail**	andecr@amwtp.inl.gov

6. Mailing address where permit will be sent (street/city/county/state/zip code): 850 Energy Drive, Suite 200, Idaho Falls, Bonneville County, Idaho, 83415

7. Physical address of permitted facility (if different than mailing address) (street/city/county/state/zip code): S of US 20/26 and SW of Experimental Breeder Reactor - I (EBR-I) on the Idaho National Laboratory (INL). Facility access from US 20/26 via Van Buren Blvd. and Adams Blvd. UTM: 335.3 km easting, 4,817.8km northing, zone T12.

8. Is the equipment portable? ☐ Yes* ☒ No ***If yes, complete and attach PERF; see instructions.**

9. NAICS codes: Primary NAICS: 924110 **Secondary NAICS**:

10. Brief business description and principal product produced: Waste Treatment

11. Identify any adjacent or contiguous facility this company owns and/or operates: Others operated by Idaho Treatment Group: WMF-610, WMF-635, WMF-628, WMF-629, WMF-630, WMF-631, WMF-632, WMF-633, WMF-634, WMF-676

12. Specify type of application ☒ **Permit to construct (PTC); application fee of $1,000 required. See instructions.**

☐ **Tier I permit** ☐ **Tier II permit** ☐ **Tier II/Permit to construct**

For Tier I permitted facilities only: If you are applying for a PTC then you must also specify how the PTC will be incorporated into the Tier I permit.

☐ **Co-process Tier I modification and PTC** ☐ **Incorporate PTC at the time of Tier I renewal** ☐ **Administratively amend the Tier I permit to incorporate the PTC upon applicant's request (IDAPA 58.01.01.209.05.a, b, or c)**

Certification

In accordance with IDAPA 58.01.01.123 (Rules for the Control of Air Pollution in Idaho), I certify based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

13. Responsible official's name	See attached certification page	**Official's title**	
Official's address			
Telephone number		**E-mail**	
Official's signature		**Date**	

☒ **14. Check here to indicate that you want to review the draft permit before final issuance.**

PERMIT TO CONSTRUCT APPLICATION CERTIFICATIONS

The undersigned certify as follows:

In accordance with IDAPA 58.01.01.123 (*Rules for the Control of Air Pollution in Idaho*), I certify based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

4/9/2013

Robert Boston
Deputy Manager for Operational Support
Department of Energy, Idaho Operations Office (DOE-ID)

Date

In accordance with IDAPA 58.01.01.123 (*Rules for the Control of Air Pollution in Idaho*), I certify based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

4/3/13

Danny Nichols
President and AMWTP Project Manager
Idaho Treatment Group, LLC

Date

FUEL BURNING EQUIPMENT & EMISSIONS INVENTORY

To whom it may concern:

The selection of forms available on the Idaho DEQ's website, "Air Quality, Checklists and Worksheets", does not include those appropriate for enumerating the fuel burning equipment associated with RCE/TSA-RE CCE activities. There are two forms that at first appeared applicable to fuel burning equipment, the Emissions Units (General) Form (EU0) and the Boiler (Emission Unit) Form (EU5).

The Emission Unit (General) Form (EU0) does not provide fields for stating fuel type and fuel/power ratings, instead it requests information that is not applicable to fuel burning equipment used in the setting of this project. The Boiler (Emission Unit) Form (EU5) provides fields for fuel type and power ratings; but is indicated for boiler use only.

Detailed information for all fuel burning equipment used within the RCE/TSA-RE CCE is located in Section 4 of the TSA-RE Permit To Construct Application document.

Information prescribed in the Emissions Inventory Forms [E1 (multiple)] has been included throughout the TSA-RE Permit To Construct Application, primarily in Section 4.0. Therefore, a specific form for Emissions Inventory has not been included with the Application Forms.

Additional information will be furnished as requested by the DEQ.

Respectfully,

Danny Nichols

Form PP – Facility Plot Plan

Scaled plot plan (RWMC/AMWTP Topographic Map) is located in Appendix B.

Modeling Information - Impact Analysis **Form MI1**

DEQ AIR QUALITY PROGRAM
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PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Company Name:	Idaho Treatment Group, LLC
Facility Name:	Transuranic Storage Area – Retrieval Enclosure
Facility ID No.:	023-00001
Brief Project Description:	Operational improvements to Retrieval Contamination Enclosure and addition of TSA-R CCE

SUMMARY OF AIR IMPACT ANALYSIS RESULTS - CRITERIA POLLUTANTS

		1.		2.	3.	4.		5.
Criteria Pollutants	Averaging Period	Significant Impact Analysis Results (µg/m3)[a c]	Significant Contribution Level (µg/m3)	Full Impact Analysis Results (µg/m3)[b c]	Background Concentration (µg/m3)	Total Ambient Impact (µg/m3)	NAAQS (µg/m3)	Percent of NAAQS
PM_{10}	24-hr	9.96E-03	5.0	6.02E-03	7.30E+01	7.30E+01	150	49%
	Annual	5.64E-04	1.0	NA	3.30E+01	NA	50	NA
$PM_{2.5}$	24-hr	6.63E-03	1.2	6.62E-03	2.76E+01	2.76E+01	35	79%
	Annual	2.47E-03	0.3	5.63E-04	7.80E+00	7.80E+00	15	52%
SO_2	1-hr	0	~7.8	7.30E-01	1.08E+02	1.09E+02	~195.5	56%
	3-hr	0	25	3.74E-01	3.40E+01	3.44E+01	1300	3%
	24-hr	0	5.0	5.38E-02	2.60E+01	2.61E+01	365	7%
	Annual	0	1.0	3.39E-03	8.00E+00	8.00E+00	80	10%
NO_2	1-hr	0	~7.5	1.30E+00	9.22E+01	9.35E+01	~188.7	50%
	Annual	0	1.0	8.27E-03	1.70E+01	1.70E+01	100	17%
CO	1-hr	0	2000	1.85E+00	3.60E+03	3.60E+03	40000	9%
	8-hr	0	500	2.97E-01	2.30E+03	2.30E+03	10000	23%
Lead	quarter	NA	NA	4.41E-10	3.00E-02	3.00E-02	1.5	2%
Ozone	1-hr	NA	NA	2.65E-01	NA	2.65E-01	235	0%

a. Significant Impacts are not required to include contributions for ambient concentrations generated by mobile fuel burning equipment (and therefore do not).
b. Full Impacts Analysis is not required for this project. The values for Full Impacts Analysis are provided for reference only.
c. See Table 4-12 of the TSA-RE Permit to Construct Application document for further details.

Modeling Information - Point Source Stack Parameters **Form MI2**

DEQ AIR QUALITY PROGRAM
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PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Company Name:	Idaho Treatment Group, LLC
Facility Name:	Transuranic Storage Area – Retrieval Enclosure
Facility ID No.:	023-00001
Brief Project Description:	Operational improvements to Retrieval Contamination Enclosure and addition of TSA-R CCE

POINT SOURCE STACK PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Stack Height (m)**	**Modeled Diameter (m)**	**Stack Exit Temperature (K)**	**Stack Exit Flowrate (acfm)**	**Stack Exit Velocity (m/s)**	**Stack orientation (e.g., horizontal, rain cap)**
Point Source(s)										
RCE Stack	RZA003	335,084	4,818,095	1,529.13	18.28	1.51	277.60	24,558	6.52	vertical, uncapped

Modeling Information - Fugitive Source Parameters **Form MI3**

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PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Company Name:	Idaho Treatment Group, LLC
Facility Name:	Transuranic Storage Area – Retrieval Enclosure
Facility ID No.:	023-00001
Brief Project Description:	Operational improvements to Retrieval Contamination Enclosure and addition of TSA-R CCE

FUGITIVE SOURCE PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Release Height (m)**	**Easterly Length (m)**	**Northerly Length (m)**	**Angle from North (°)**	**Initial Vertical Dimension (m)**	**Initial Horizontal Dimension (m)**
Area Source(s)										
No area sources.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Modeling Information - Buildings and Structures **Form MI4**

DEQ AIR QUALITY PROGRAM
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PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Company Name:	Idaho Treatment Group, LLC
Facility Name:	Transuranic Storage Area – Retrieval Enclosure
Facility ID No.:	023-00001
Brief Project Description:	Operational improvements to Retrieval Contamination Enclosure and addition of TSA-R CCE

BUILDING AND STRUCTURE INFORMATION

1. Building ID Number	2. Length (ft)	3. Width (ft)	4. Base Elevation (m)	5. Building Height (m)	6. Number of Tiers	7. Description/Comments
BLD18	1175.00	384.00	1530.04	16.46	1	WMF-636 (TSA-RE) which contains the RCE/ICE and TSA-R CCE.
BLD43	33.75	70.50	1530.04	16.46	1	WMF-636b (weather enclosure) attached to WMF-636.

a. No other buildings meet significance criteria for downwash according to modeling guideline. See Appendix E of the TSA-RE Permit To Construct Application for additional information.

APPENDIX B. RWMC/AMWTP ~~Topographic Map~~*TOPOGRAPHIC MAP*

RWMC/AMWTP

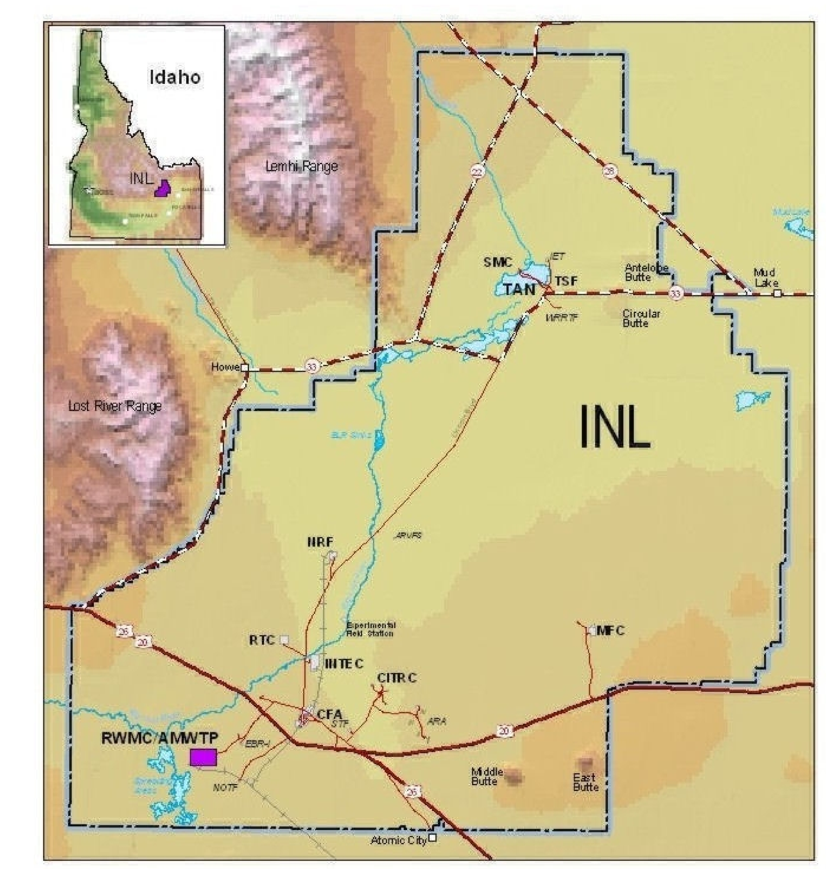
Legend

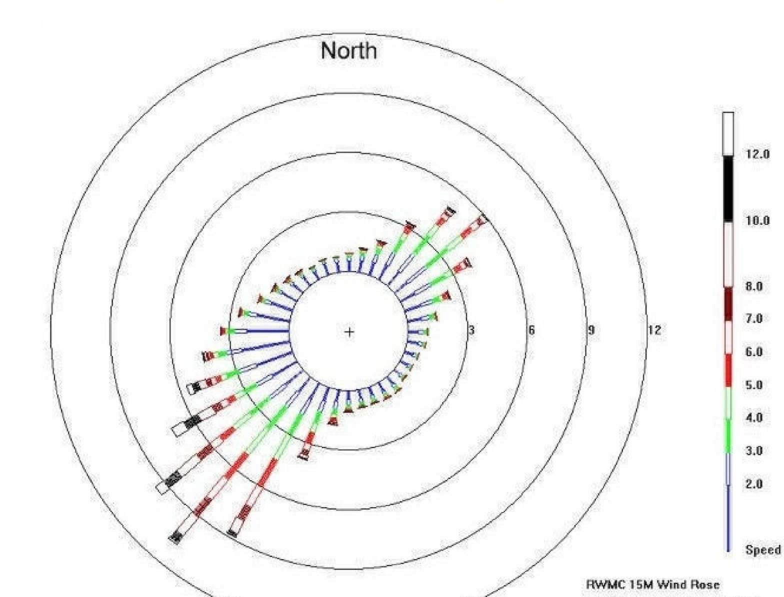
- Catchment Area I
- Catchment Area II
- Catchment Area III
- Catchment Area IV
- Catchment Area V
- Catchment Area VI
- Catchment Area VII
- Catchment Area VIII
- Loading/Unloading Areas
- Fire Water Line
- Sewer Line
- flow_arrows arc
- Trailer/TRUPACK Storage Areas
- 2-ft Contours
- 10-ft Index Contours
- Roads
- Railroad Tracks
- Fences
- Radiation Fences
- Culverts
- Sewage Lagoons
- RCRA Permitted Treatment and Storage Areas
- Buildings
- Tanks
- Channel to Big Lost River
- Groundwater Monitoring Wells
- Perch Water Monitoring Wells
- VVE Extraction Wells
- OCVZ Vapor Monitoring Wells
- Lysimeters (Soil Moisture) Wells
- Potable Water Well

NOTES:
Landuse: RWMC facility boundaries are surrounded by restricted-access federal lands.

Legal Description: RWMC facility boundaries are located in Township 2 North, Range 29 East, Sections 17 and 18.

100-year floodplain: Portions of the RWMC facility boundaries are located within the 100-year floodplain. The AMWTF, WMF-610, and WMF-628 through -635 boundaries are not located within the 100-year floodplain. If a 100-year flood were to occur the existing surface water drainage control system would prevent washout of any of the RWMC TSA HWMA regulated units.





N
W E
S

Meters: 0 25 50 100 150 200 250 300 350

Feet: 0 100 200 400 600 800 1,000 1,200

Project: AMWTP
Map Requestor: Christian T. Maupin
GIS Analyst: Dan Mahnami
Date Drawn: 12/16/2009
Disclaimer: Contact the SAL at 526-3529 for information about the data shown on this map.
Path: X:\gis_projects3\rwmc\rwmc_permit_maps
File Name: RWMC_2ft_Contours_2007-EL_V1.mxd

APPENDIX C. NESHAP ANALYSIS

INTRODUCTION AND SUMMARY OF RESULTS

This appendix is being submitted with the Transuranic Storage Area (TSA) – Retrieval Enclosure (TSA-RE) Permit To Construct (PTC) application to support the radionuclide analysis for the changes to be made to the TSA-RE and proposed retrieval/treatment operations. It was determined, using Title 40 of the Code of Federal Regulations (CFR) 61 Appendix D, that the emissions as a result of modifications to be made to TSA-RE will not exceed 0.1 mrem/yr.

Calculated Maximum Individual Dose. The calculated maximum individual dose from airborne emissions for the most conservative location at which the public can be exposed to radioactive emissions from the Retrieval Contamination Enclosure (RCE) / Inner Contamination Enclosure (ICE) *and the Transuranic Storage Area Pad R Contamination Control Enclosure (TSA-R CCE)*, the southern *boundary of the* Idaho National Laboratory (INL) ~~boundary~~ (Staley, 1998), is *4.84E-04*~~4.16E-05~~ mrem/yr. This effective dose equivalent (EDE) concentration was based on several assumptions detailed in Section 1.0. Actual emissions are expected to result in much lower EDEs.

Unabated Dose Analysis. The calculated, unabated dose (*2.08E+00*~~7.65E-01~~ mrem/yr) at the INL site boundary does exceed 0.1 mrem/yr for ~~retrieval~~ operations in the RCE/ICE *and TSA-R CCE*. Therefore, monitoring of the RCE/ICE stack emissions is required per 40 CFR 61.93(b)(2). The unabated EDE was based on the same factors as for the abated analysis with the exception that credit for high efficiency particulate air (HEPA) filter removal efficiency is not included for the unabated analysis. In addition, a release factor of 1E-04 was used for liquids when determining if air monitoring is required for the RCE/ICE *and TSA-R CCE. The release factor of* ~~rather than~~ 1E-03 *was used to meet the* ~~as~~ require*ments* ~~d by~~*of* 40 CFR 61 Appendix D.

1.0 RADIONUCLIDE SOURCE TERM

The source term for atmospheric radionuclide releases from the RCE/ICE *and TSA-R CCE* depends on several assumptions, including the number of ruptured waste containers encountered each year, the amount of each radionuclide released from the ruptured containers, the unit-dose for each radionuclide, and the removal efficiencies of the filters used for each retrieval operation that could contribute to the source term. The detailed assumptions used are provided in subsequent headings.

1.1 Waste Description

From the original 53,300 cubic meters (m^3) of waste stored in the TSA-RE, approximately ~~8,900~~*6,200* m^3 remains to be retrieved and/or treated *as of August 2012*. The description of individual waste streams in storage at the TSA (~~Ravio~~*Raivo*, 1995) was used to group the remaining TSA inventory into seven general debris waste categories (WCs) and three general non-debris categories.

Debris waste includes metal debris (MD), ceramic/brick debris (CBD), inorganic debris (ID), heterogeneous debris (HD), graphite (G), organic debris (OD), and paper/rags/plastic/rubber (PRPR).

Non-debris waste includes inorganic homogeneous solids (IHS), organic homogeneous solids (OHS), and soils.

1.2 Annual Retrieval Rate

The remaining mixed waste (MW) at the TSA-RE is to be retrieved at a nominal rate of 42,476 55-gallon (gal) drum equivalents (DE) per year. This equates to a volume of approximately 8,835 m^3. At this rate, the inventoried waste in TSA-RE would be removed in ~~approximately~~ *less than* 1 year, assuming consistent removal operations. This assumption is based upon the following daily rates:*: 160, 55-gal drum equivalents ~~(100% breached)~~ retrieved; 16 55-gal drum equivalents ~~(100% breached)~~ being treated for liquids; 16 55-gal drum equivalents ~~(100% breached)~~ resized/repackaged within areas with two stages of HEPA filtration ventilation; and, 160, 55-gal drum equivalents ~~(100% breached)~~ re-sized/repackaged within areas with 3 stages of HEPA filtration ventilation*~~150 55-gal drums (10% breached), 10 boxes~~

~~(25% breached), and 80 55-gal drums in cargo containers (10% breached). In addition to releases from retrieval operations, consideration is made for the following treatment operations: 30 55-gal drums will be treated via absorption, decanting, and/or neutralization and 40 55-gal drums will be repackaged/sized per day~~.

1.3 Radionuclide Inventory

A documented inventory of the radionuclides in TSA-stored waste (Table 4-1 of ~~Ravio~~*Raivo*, et al., 1995) was used as the basis for inventory calculations. All radionuclides present in the waste at greater than 1 Curie *(Ci)* were included. The radiological makeup of each container of TSA waste is uncertain. Therefore, this analysis assumes the radionuclides are evenly distributed throughout the waste. Table C-1 is the inventory of radionuclides in the 65,000 m^3 of TSA waste, also shown per kg and per m^3. The same distribution of waste is assumed to pertain to all waste in TSA-RE.

1.4 Release Factors

During retrieval, some fraction of the radionuclides in the breached containers will be released to the atmosphere. To determine the appropriate factor for the conditions within the TSA-RE, the values in 40 CFR 61, Appendix D, for the physical state of the waste were used for determining the abated EDE. A release factor of 1E-06 and 1E-03 are applied to solids and liquids respectively. For determining if monitoring is required, a release factor of 1E-06 was used for solids and 1-04 was used for liquids. In both analyses, it was assumed gases are considered to have a release factor of 1.0. Based on observed conditions, ~~10% of retrieved DEs and 25% of retrieved boxes are assumed to be breached (both inner and outer containment layers are ruptured). I~~*i*t was assumed that 100% of the contents are available for release from each breached container encountered.

1.5 Air Pollution Control

Airborne radionuclides will pass through at least two HEPA filters with 99.97% removal efficiency. ~~Those airborne radionuclides released during box retrieval operations and treatment operations will pass through three HEPA filters with 99.97% removal efficiency.~~ All filtration calculations assume 99.9% efficiency, which offers greater conservatism by one order of magnitude. Consideration for HEPA filtration is not applied to gaseous radionuclides H-3 and C-14.

1.6 Summary

The factors for breached container rates and release factors combined with credit for filtration yield the assumed radioactive air emissions from the RCE/ICE *and TSA-R CCE.*

Source	Container Breach Rate	Waste Available for Release	Release Factor for Solids (Appendix D)	Release Factor for Liquids (Appendix D)	Release Factor for Solids (Monitoring)	Release Factor for Liquids (Monitoring)	Release Factor for Gases	HEPA Factor (@ 99.9% per HEPA)
55-gal Drums	0.1 (10%)	1.0 (100%)	1.0E-06	1.0E-03	1.0E-06	1.0E-04	1.0	*2 stages HEPA 1.0E-0~~4~~6* *3 stages HEPA 1.E-069*~~1.0E-06~~
Boxes	0.25 (25%)	1.0 (100%)	1.0E-06	1.0E-03	1.0E-06	1.0E-04	1.0	*2 stages HEPA 1.0E-0~~4~~6* *3 stages HEPA 1.E-069*~~1.0E-09~~
Cargo Drums	0.1 (10%)	1.0 (100%)	1.0E-06	1.0E-03	1.0E-06	1.0E-04	1.0	*2 stages HEPA 1.0E-0~~4~~6* *3 stages HEPA 1.E-069*~~1.0E-06~~
Treatment	1.0 (100%)	1.0 (100%)	1.0E-06	1.0E-03	1.0E-06	1.0E-04	1.0	*2 stages HEPA 1.0E-0~~4~~6* *3 stages HEPA 1.E-069*~~1.0E-09~~

National Emission Standards for Hazardous Air Pollutants (NESHAPs) modeling was done using the Clean Air Act Assessment Package (CAP88-PC) computer code; an Environmental Protection Agency (EPA) approved program designed for assessment of dose and risk from radionuclide emissions to air in compliance with NESHAP for radionuclides at Department of Energy (DOE) facilities. The source terms used for the CAP88-PC analysis are presented in Table C-2.

1.7 Calculations

The calculation values for the abated (i.e., HEPA filtered) source term are located in Table C-2 and Table C-3. The calculated values for the unabated source term are located in Table C-4. The following steps were taken to arrive at the estimates in the tables:

- The total activity in Ci for each radionuclide (Table 4.1, ~~Ravio~~ *Raivo* et al. 1995) was divided by the total mass (35,107,163 kg) of the waste. The resulting activity concentrations in Ci/kg for each radionuclide were multiplied by the average density of the waste (540.1 kg/m^3) to obtain volume-based activity concentrations in Ci/m^3, which is suitable for volume based operation rates. These concentrations are listed in Table C-1.

- Daily retrieval rates for drums and boxes were converted to m^3/day using a factor of 0.208 m^3 per drum and 3.172 m^3 per box. The resulting retrieval rates were used in the following equation to determine activity released from each retrieval operation per year for each radionuclide:
    - Activity released (Ci/yr) = activity concentration (Ci/m^3) x retrieval rate (m^3/day) x breach rate (%) x 365 day/yr x [% liquid x LRF + (1 - % liquid) x SRF], where LRF = liquids release factor and SRF = solids release factor.
- The total number of containers ~~which~~ *that* will be treated per day was converted to m^3/day using a factor of 0.208 m^3 per 55-gal drum. The resulting treatment rate was used in the following equation to determine activity released from treatment operations per year for each radionuclide:
    - Activity released (Ci/yr) = activity concentration (Ci/m^3) x treatment rate (m^3/day) x 365 day/yr x [% liquid x LRF + (1 - % liquid) x SRF], where LRF = liquids release factor and SRF = solids release factor.
- The activity released (Ci/yr) from each operation was added to determine the total activity released from the RCE/ICE *and TSA-R CCE* for each radionuclide.
- The total abated activity released from the RCE/ICE *and TSA-R CCE* (in Ci/yr) was calculated by applying the appropriate HEPA filtration factor to each process, for each radionuclide:
    - Abated activity released (Ci/yr) = {[drum activity (Ci/yr) + cargo drum activity (Ci/yr)] x 0.01^~~RCE~~ *number of* HEPA} + {[box activity (Ci/yr) + treatment activity (Ci/yr)] x 0.01^[*number of* ~~ICE~~ HEPAs]}
- HEPA filtration was not applied to gaseous radionuclides H-3 and C-14.
- The unit dose in mrem/Ci specific to each radionuclide was applied to the corresponding activity release values for each radionuclide in Ci/year to determine the received dose rate in mrem/year. This was performed for *abated and* unabated ~~and abated~~ releases. These figures can be found in Table C-3 and Table C-4.
- Dose equivalent (mrem/yr) = activity released * unit dose (mrem/Ci)

The assumptions utilized (minus the HEPA removal efficiency) represent an unmitigated release scenario. Including the HEPA filter removal efficiency constitutes the mitigated release scenario. These two cases are considered bounding for ~~the retrieval~~ operations within the RCE/ICE *and TSA-R CCE*.

Table C-1. Radionuclide Inventory for RCE/ICE *and TSA-R CCE* Waste

Radionuclide[a]	Total Best Estimate Activity[b] (Ci)	Average Activity by Mass[c] Ci/kg	Average Activity by Volume[d] Ci/m³
Am-241	1.22E+05	3.48E-03	1.88E+00
Pu-238	1.16E+05	3.30E-03	1.78E+00
Pu-239	6.87E+04	1.96E-03	1.06E+00
Pu-240	1.59E+04	4.53E-04	2.45E-01
Pu-242	1.04E+00	2.96E-08	1.60E-05
Pu-241	1.61E+05	4.59E-03	2.48E+00
Ba-137m	2.25E+03	6.41E-05	3.46E-02
Cs-137	2.26E+03	6.44E-05	3.48E-02
Sr-90	2.02E+03	5.75E-05	3.11E-02
Y-90	2.02E+03	5.75E-05	3.11E-02
U-233	1.02E+03	2.91E-05	1.57E-02
Cm-244	5.39E+02	1.54E-05	8.29E-03
H-3	2.64E+02	7.52E-06	4.06E-03
Cs-134	1.11E+02	3.16E-06	1.71E-03
Co-60	1.00E+02	2.85E-06	1.54E-03
Bi-212	2.66E+01	7.58E-07	4.09E-04
C-14	2.38E+00	6.78E-08	3.66E-05
Ce-144	2.71E+01	7.72E-07	4.17E-04
Fe-55	1.13E+00	3.22E-08	1.74E-05
Kr-85	6.86E+00	1.95E-07	1.06E-04
Ni-63	3.57E+00	1.02E-07	5.49E-05
Pb-212	2.66E+01	7.58E-07	4.09E-04
Pm-147	2.73E+01	7.78E-07	4.20E-04
Po-212	1.70E+01	4.84E-07	2.62E-04
Po-216	2.66E+01	7.58E-07	4.09E-04
Pr-144	2.72E+01	7.75E-07	4.18E-04
Ra-224	2.66E+01	7.58E-07	4.09E-04
Sb-125	1.65E+00	4.70E-08	2.54E-05
Th-228	2.66E+01	7.58E-07	4.09E-04
Th-232	7.31E+00	2.08E-07	1.12E-04
Tl-208	9.54E+00	2.72E-07	1.47E-04
U-232	2.60E+01	7.41E-07	4.00E-04
U-234	5.78E+00	1.65E-07	8.89E-05

a. Radionuclides from Table 4-1 INEL-95/0412. Radon (Rn-220) not included per 40 CFR 61, Subpart H.
b. Best estimate activities from Table 4-1 INEL-95/0412.
c. Based on Total Mass of 35,107,163 kg.
d. Based on Total Volume of 65,000 m³, for an average density of 540.11 kg/m³.

Table C-2. Individual Emissions Estimates for Each Source in the RCE/ICE

Nuclide	Average AMWTP Waste Activity Concentration (Ci/m³)	Activity Released From Breached TSA-RE Drums (Ci/yr)[a,b]	Activity Released From Breached TSA-RE Boxes (Ci/yr)[a,b]	Activity Released From Breached Cargo Drums (Ci/yr)[b,c]	Activity Released From Treatment Operations (Ci/yr)[d]	Total Activity Released from TSA-RE (Unabated) (Ci/yr)[e]
Am-241	1.88E+00	2.35E-02	5.97E-02	1.25E-02	5.08E-01	6.04E-01
Pu-238	1.78E+00	2.23E-02	5.68E-02	1.19E-02	4.83E-01	5.74E-01
Pu-239	1.06E+00	1.32E-02	3.36E-02	7.05E-03	2.86E-01	3.40E-01
Pu-240	2.45E-01	3.06E-03	7.78E-03	1.63E-03	6.62E-02	7.87E-02
Pu-242	1.60E-05	2.00E-07	5.09E-07	1.07E-07	4.33E-06	5.15E-06
Pu-241	2.48E+00	3.10E-02	7.88E-02	1.65E-02	6.71E-01	7.97E-01
Ba-137m	3.46E-02	4.33E-04	1.10E-03	2.31E-04	9.37E-03	1.11E-02
Cs-137	3.48E-02	4.35E-04	1.11E-03	2.32E-04	9.41E-03	1.12E-02
Sr-90	3.11E-02	3.89E-04	9.89E-04	2.07E-04	8.41E-03	1.00E-02
Y-90	3.11E-02	3.89E-04	9.89E-04	2.07E-04	8.41E-03	1.00E-02
U-233	1.57E-02	1.96E-04	4.99E-04	1.05E-04	4.25E-03	5.05E-03
Cm-244	8.29E-03	1.04E-04	2.64E-04	5.54E-05	2.25E-03	2.67E-03
H-3[f]	4.06E-03	5.08E-05	1.29E-04	2.71E-05	1.10E-03	1.31E-03
Cs-134	1.71E-03	2.14E-05	5.43E-05	1.14E-05	4.62E-04	5.49E-04
Co-60	1.54E-03	1.93E-05	4.89E-05	1.03E-05	4.17E-04	4.95E-04
Bi-212	4.09E-04	5.12E-06	1.30E-05	2.73E-06	1.11E-04	1.32E-04
C-14[f]	3.66E-05	4.58E-07	1.16E-06	2.44E-07	9.91E-06	1.18E-05
Ce-144	4.17E-04	5.22E-06	1.33E-05	2.78E-06	1.13E-04	1.34E-04
Fe-55	1.74E-05	2.18E-07	5.53E-07	1.16E-07	4.71E-06	5.59E-06
Kr-85	1.06E-04	1.32E-06	3.36E-06	7.04E-07	2.86E-05	3.40E-05
Ni-63	5.49E-05	6.87E-07	1.75E-06	3.67E-07	1.49E-05	1.77E-05
Pb-212	4.09E-04	5.12E-06	1.30E-05	2.73E-06	1.11E-04	1.32E-04
Pm-147	4.20E-04	5.26E-06	1.34E-05	2.80E-06	1.14E-04	1.35E-04
Po-212	2.62E-04	3.27E-06	8.32E-06	1.75E-06	7.08E-05	8.42E-05
Po-216	4.09E-04	5.12E-06	1.30E-05	2.73E-06	1.11E-04	1.32E-04
Pr-144	4.18E-04	5.24E-06	1.33E-05	2.79E-06	1.13E-04	1.35E-04
Ra-224	4.09E-04	5.12E-06	1.30E-05	2.73E-06	1.11E-04	1.32E-04
Sb-125	2.54E-05	3.18E-07	8.07E-07	1.69E-07	6.87E-06	8.17E-06
Th-228	4.09E-04	5.12E-06	1.30E-05	2.73E-06	1.11E-04	1.32E-04
Th-232	1.12E-04	1.41E-06	3.58E-06	7.51E-07	3.05E-05	3.62E-05
Tl-208	1.47E-04	1.84E-06	4.67E-06	9.80E-07	3.97E-05	4.72E-05
U-232	4.00E-04	5.01E-06	1.27E-05	2.67E-06	1.08E-04	1.29E-04
U-234	8.89E-05	1.11E-06	2.83E-06	5.94E-07	2.41E-05	2.86E-05
Totals =	9.52E-02	2.42E-01	5.08E-02	2.06E+00	2.45E+00	2.88E+01

a. Volumes are calculated using the following conversion factors: (a) 0.208 m³/55-gal drum and (b) 3.172 m³/box.
b. A liquid concentration of 5% is used for all liquid treatment activities (i.e., absorption, decanting, and neutralization). A liquid concentration of 1% is used for all other activities.
c. This figure represents the volume of waste from drums stored in cargos. Assumes waste is stored in 55-gal drums within the cargo container.
d. Treatment processing rates are not based upon the remaining waste volumes or rate of waste retrieval.
e. Filtration factor not included (i.e., unabated).
f. No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.

Table C-2. Individual Emissions Estimates for Each Source in the RCE/ICE and TSA-R CCE

Nuclide	Average AMWTP Waste Activity Concentration (Ci/m³)	Activity Released From Breached TSA-RE Containers RCE(~~2 Stages HEPA~~) (Ci/yr)[a,b]	Activity Released From Treatment TSA-RE ICE/CCE(~~3 Stages HEPA~~) (Ci/yr)[a,b]	Activity Released From Treatment TSA-RE RCE(~~2 Stages HEPA~~) (Ci/yr)[b,c]	Total Activity Released from TSA-RE (Unabated) (Ci/yr)[e]
Am-241	1.88E+00	2.51E-01	2.51E-01	2.32E-01	7.33E-01
Pu-238	1.78E+00	2.38E-01	2.38E-01	2.21E-01	6.97E-01
Pu-239	1.06E+00	1.41E-01	1.41E-01	1.31E-01	4.13E-01
Pu-240	2.45E-01	3.27E-02	3.27E-02	3.03E-02	9.56E-02
Pu-242	1.60E-05	2.14E-06	2.14E-06	1.98E-06	6.25E-06
Pu-241	2.48E+00	3.31E-01	3.31E-01	3.07E-01	9.68E-01
Ba-137m	3.46E-02	4.62E-03	4.62E-03	4.28E-03	1.35E-02
Cs-137	3.48E-02	4.64E-03	4.64E-03	4.30E-03	1.36E-02
Sr-90	3.11E-02	4.15E-03	4.15E-03	3.85E-03	1.21E-02
Y-90	3.11E-02	4.15E-03	4.15E-03	3.85E-03	1.21E-02
U-233	1.57E-02	2.09E-03	2.09E-03	1.94E-03	6.13E-03
Cm-244	8.29E-03	1.11E-03	1.11E-03	1.03E-03	3.24E-03
H-3[f]	4.06E-03	5.42E-04	5.42E-04	5.03E-04	1.59E-03
Cs-134	1.71E-03	2.28E-04	2.28E-04	2.11E-04	6.67E-04
Co-60	1.54E-03	2.05E-04	2.05E-04	1.90E-04	6.01E-04
Bi-212	4.09E-04	5.46E-05	5.46E-05	5.07E-05	1.60E-04
C-14[f]	3.66E-05	4.89E-06	4.89E-06	4.53E-06	1.43E-05
Ce-144	4.17E-04	5.57E-05	5.57E-05	5.16E-05	1.63E-04
Fe-55	1.74E-05	2.32E-06	2.32E-06	2.15E-06	6.79E-06
Kr-85	1.06E-04	1.41E-05	1.41E-05	1.31E-05	4.12E-05
Ni-63	5.49E-05	7.33E-06	7.33E-06	6.80E-06	2.15E-05
Pb-212	4.09E-04	5.46E-05	5.46E-05	5.07E-05	1.60E-04
Pm-147	4.20E-04	5.61E-05	5.61E-05	5.20E-05	1.64E-04
Po-212	2.62E-04	3.49E-05	3.49E-05	3.24E-05	1.02E-04
Po-216	4.09E-04	5.46E-05	5.46E-05	5.07E-05	1.60E-04
Pr-144	4.18E-04	5.59E-05	5.59E-05	5.18E-05	1.64E-04
Ra-224	4.09E-04	5.46E-05	5.46E-05	5.07E-05	1.60E-04
Sb-125	2.54E-05	3.39E-06	3.39E-06	3.14E-06	9.92E-06
Th-228	4.09E-04	5.46E-05	5.46E-05	5.07E-05	1.60E-04
Th-232	1.12E-04	1.50E-05	1.50E-05	1.39E-05	4.39E-05
Tl-208	1.47E-04	1.96E-05	1.96E-05	1.82E-05	5.74E-05
U-232	4.00E-04	5.34E-05	5.34E-05	4.95E-05	1.56E-04
U-234	8.89E-05	1.19E-05	1.19E-05	1.10E-05	3.47E-05
Totals =	**7.61E+00**	**1.02E+00**	**1.02E+00**	**9.42E-01**	**2.97E+00**

a. *Volumes are calculated using the following conversion factors: (a) 0.208 m³/55 gal drum and (b) 3.172 m³/box.*
b. *A liquid concentration of 5% is used for all liquid treatment activities (i.e., absorption, decanting, and neutralization). A liquid concentration of 1% is used for all other activities.*
c. *This figure represents the volume of waste from drums stored in cargos. Assumes waste is stored in 55-gal drums within the cargo container.*
d. *Treatment processing rates are not based upon the remaining waste volumes or rate of waste retrieval.*
e. *Filtration factor not included (i.e., unabated).*
f. *No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.*

~~**Table C-3. 40 Part 61, Appendix D Emissions Estimates for the RCE/ICE**~~

~~Nuclide~~	~~Total Activity Released from TSA-RE (Unabated) (Ci/yr)[a]~~	~~Unit Ci Dose (mrem/Ci)[b]~~	~~Total ICE (or equivalent) Unabated (mrem/yr)[a]~~	~~Total RCE Unabated (mrem/yr)[a]~~	~~Total Unabated (mrem/yr)[a]~~	~~Total Abated (mrem/yr)[c,d]~~
Am-241	6.04E-01	3.40E+00	1.93E+00	1.22E-01	2.05E+00	1.42E-05
Pu-238	5.74E-01	3.80E+00	2.05E+00	1.30E-01	2.18E+00	1.51E-05
Pu-239	3.40E-01	4.10E+00	1.31E+00	8.32E-02	1.39E+00	9.63E-06
Pu-240	7.87E-02	4.10E+00	3.03E-01	1.92E-02	3.23E-01	2.23E-06
Pu-242	5.15E-06	3.90E+00	1.89E-05	1.20E-06	2.01E-05	1.39E-10
Pu-241	7.97E-01	7.40E-02	5.55E-02	3.52E-03	5.90E-02	4.07E-07
Ba-137m	1.11E-02	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-02	7.80E-02	8.21E-04	5.20E-05	8.73E-04	6.03E-09
Sr-90	1.00E-02	1.50E-01	1.41E-03	8.95E-05	1.50E-03	1.04E-08
Y-90	1.00E-02	1.20E-04	1.13E-06	7.16E-08	1.20E-06	8.28E-12
U-233	5.05E-03	3.00E-01	1.42E-03	9.03E-05	1.51E-03	1.05E-08
Cm-244	2.67E-03	2.20E+00	5.52E-03	3.50E-04	5.87E-03	4.05E-08
H-3[e]	1.31E-03	2.80E-05	3.44E-08	2.18E-09	3.66E-08	3.66E-08
Cs-134	5.49E-04	9.90E-02	5.12E-05	3.24E-06	5.44E-05	3.76E-10
Co-60	4.95E-04	2.50E-02	1.16E-05	7.38E-07	1.24E-05	8.54E-11
Bi-212	1.32E-04	2.30E-03	2.85E-07	1.81E-08	3.03E-07	2.09E-12
C-14[e]	1.18E-05	5.60E-04	6.20E-09	3.93E-10	6.60E-09	6.60E-09
Ce-144	1.34E-04	4.00E-03	5.05E-07	3.20E-08	5.37E-07	3.70E-12
Fe-55	5.59E-06	2.70E-04	1.42E-09	9.01E-11	1.51E-09	1.04E-14
Kr-85	3.40E-05	9.90E-08	3.16E-12	2.01E-13	3.36E-12	2.32E-17
Ni-63	1.77E-05	4.00E-04	6.65E-09	4.22E-10	7.07E-09	4.88E-14
Pb-212	1.32E-04	1.40E-02	1.73E-06	1.10E-07	1.84E-06	1.27E-11
Pm-147	1.35E-04	4.70E-04	5.97E-08	3.79E-09	6.35E-08	4.39E-13
Po-212	8.42E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Po-216	1.32E-04	5.50E-08	6.81E-12	4.32E-13	7.24E-12	5.00E-17
Pr-144	1.35E-04	1.60E-06	2.03E-10	1.28E-11	2.15E-10	1.49E-15
Ra-224	1.32E-04	2.40E-01	2.97E-05	1.88E-06	3.16E-05	2.18E-10
Sb-125	8.17E-06	2.70E-03	2.07E-08	1.32E-09	2.21E-08	1.52E-13
Th-228	1.32E-04	3.20E+00	3.96E-04	2.51E-05	4.21E-04	2.91E-09
Th-232	3.62E-05	2.10E+00	7.15E-05	4.53E-06	7.60E-05	5.25E-10
Tl-208	4.72E-05	8.20E-06	3.64E-10	2.31E-11	3.87E-10	2.67E-15
U-232	1.29E-04	7.30E-01	8.84E-05	5.60E-06	9.40E-05	6.49E-10
U-234	2.86E-05	3.00E-01	8.07E-06	5.12E-07	8.58E-06	5.93E-11
Totals =	2.88E+01	-	5.66E+00	3.59E-01	6.02E+00	4.16E-05

~~a. Filtration factor not included (i.e., unabated).~~

~~b. Dose to maximum exposed individual at INL boundary, 5,700 m SSW of RWMC, as calculated by CAP-88 code using 10 yr average meteorology from the RWMC met station. See Attachment 1 of Appendix C.~~

~~c. Drum retrieval occurs within the overall RCE, which is vented through a stack utilizing two HEPA filters. Box retrieval and treatment operations occur inside the ICE (or equivalent) unit within the RCE. The ICE unit ventilation employs one HEPA filter prior to release to the main RCE operating area, for a total efficiency equivalent of three HEPA filters.~~

~~d. See section *1.7 - Calculations*, for specific calculations used to obtain these totals.~~

~~e. No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.~~

Table C-3. 40 Part 61, Appendix D Emissions Estimates for the RCE/ICE and TSA-R CCE

Nuclide	*Total Activity Released from TSA-RE (Unabated) (Ci/yr)*[a]	*Unit Ci Dose (mrem/Ci)*[b]	*ICE/CCE~~Total 3-Stages HEPA~~ (or equivalent) Unabated (mrem/yr)*[a]	*RCE~~Total 2-Stages HEPA~~ Unabated (mrem/yr)*[a]	*Total Unabated (mrem/yr)*[a]	*Total Abated (mrem/yr)*[c,d]
Am-241	7.33E-01	3.40E+00	8.52E-01	1.64E+00	2.49E+00	1.65E-04
Pu-238	6.97E-01	3.80E+00	9.05E-01	1.74E+00	2.65E+00	1.75E-04
Pu-239	4.13E-01	4.10E+00	5.78E-01	1.11E+00	1.69E+00	1.12E-04
Pu-240	9.56E-02	4.10E+00	1.34E-01	2.58E-01	3.92E-01	2.59E-05
Pu-242	6.25E-06	3.90E+00	8.33E-06	1.61E-05	2.44E-05	1.61E-09
Pu-241	9.68E-01	7.40E-02	2.45E-02	4.72E-02	7.16E-02	4.74E-06
Ba-137m	1.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.36E-02	7.80E-02	3.62E-04	6.98E-04	1.06E-03	7.01E-08
Sr-90	1.21E-02	1.50E-01	6.22E-04	1.20E-03	1.82E-03	1.21E-07
Y-90	1.21E-02	1.20E-04	4.98E-07	9.59E-07	1.46E-06	9.64E-11
U-233	6.13E-03	3.00E-01	6.28E-04	1.21E-03	1.84E-03	1.22E-07
Cm-244	3.24E-03	2.20E+00	2.44E-03	4.69E-03	7.13E-03	4.72E-07
H-3[e]	1.59E-03	2.80E-05	1.52E-08	2.93E-08	4.44E-08	4.44E-08
Cs-134	6.67E-04	9.90E-02	2.26E-05	4.35E-05	6.61E-05	4.37E-09
Co-60	6.01E-04	2.50E-02	5.13E-06	9.90E-06	1.50E-05	9.95E-10
Bi-212	1.60E-04	2.30E-03	1.26E-07	2.42E-07	3.68E-07	2.43E-11
C-14[e]	1.43E-05	5.60E-04	2.74E-09	5.28E-09	8.01E-09	8.01E-09
Ce-144	1.63E-04	4.00E-03	2.23E-07	4.29E-07	6.52E-07	4.31E-11
Fe-55	6.79E-06	2.70E-04	6.27E-10	1.21E-09	1.83E-09	1.21E-13
Kr-85	4.12E-05	9.90E-08	1.39E-12	2.69E-12	4.08E-12	2.70E-16
Ni-63	2.15E-05	4.00E-04	2.93E-09	5.65E-09	8.59E-09	5.68E-13
Pb-212	1.60E-04	1.40E-02	7.65E-07	1.47E-06	2.24E-06	1.48E-10
Pm-147	1.64E-04	4.70E-04	2.64E-08	5.08E-08	7.71E-08	5.11E-12
Po-212	1.02E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Po-216	1.60E-04	5.50E-08	3.00E-12	5.79E-12	8.80E-12	5.82E-16
Pr-144	1.64E-04	1.60E-06	8.94E-11	1.72E-10	2.62E-10	1.73E-14
Ra-224	1.60E-04	2.40E-01	1.31E-05	2.53E-05	3.84E-05	2.54E-09
Sb-125	9.92E-06	2.70E-03	9.15E-09	1.76E-08	2.68E-08	1.77E-12
Th-228	1.60E-04	3.20E+00	1.75E-04	3.37E-04	5.12E-04	3.39E-08
Th-232	4.39E-05	2.10E+00	3.15E-05	6.08E-05	9.23E-05	6.11E-09
Tl-208	5.74E-05	8.20E-06	1.61E-10	3.10E-10	4.70E-10	3.11E-14
U-232	1.56E-04	7.30E-01	3.90E-05	7.51E-05	1.14E-04	7.55E-09
U-234	3.47E-05	3.00E-01	3.56E-06	6.86E-06	1.04E-05	6.90E-10
Totals =	**2.97E+00**	**2.88E+01**	**2.50E+00**	**4.82E+00**	**7.31E+00**	**4.84E-04**

a. Filtration factor not included (i.e., unabated).

b. Dose to maximum exposed individual at INL boundary, 5,700 m SSW of RWMC, as calculated by CAP-88 code using 10 yr average meteorology from the RWMC met station. See Attachment 1 of Appendix C.

c. Retrieval and treatment occurs within the overall RCE/TSA-R CCE, which is vented through a stack utilizing two and three stages HEPA filters respectively.

d. See section 1.7 - Calculations, for specific calculations used to obtain these totals.

e. No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.

Table C-4. Continuous Air Monitoring Emissions Estimates for the RCE/ICE

Nuclide	Average AMWTP Waste Activity Concentration (Ci/kg)[a]	Average AMWTP Waste Activity Concentration (Ci/m³)[b]	Activity Released From Breached TSA-RE Drums (Ci/yr)[c]	Activity Released From Breached TSA-RE Boxes (Ci/yr)[c]	Activity Released From Breached Cargo Drums (Ci/yr)[c]	Activity Released From Treatment Operations (Ci/yr)[c]	Total Activity Released from TSA-RE (Unabated) (Ci/yr)[d]	Unit Ci Dose (mrem/Ci)[e]	Total Unabated (mrem/yr)
Am-241	3.48E-03	1.88E+00	4.25E-03	1.08E-02	2.27E-03	5.93E-02	7.67E-02	3.40E+00	2.61E-01
Pu-238	3.30E-03	1.78E+00	4.04E-03	1.03E-02	2.16E-03	5.64E-02	7.29E-02	3.80E+00	2.77E-01
Pu-239	1.96E-03	1.06E+00	2.40E-03	6.09E-03	1.28E-03	3.34E-02	4.32E-02	4.10E+00	1.77E-01
Pu-240	4.53E-04	2.45E-01	5.54E-04	1.41E-03	2.96E-04	7.73E-03	9.99E-03	4.10E+00	4.10E-02
Pu-242	2.96E-08	1.60E-05	3.63E-08	9.22E-08	1.93E-08	5.06E-07	6.54E-07	3.90E+00	2.55E-06
Pu-241	4.59E-03	2.48E+00	5.61E-03	1.43E-02	2.99E-03	7.83E-02	1.01E-01	7.40E-02	7.49E-03
Ba-137m	6.41E-05	3.46E-02	7.84E-05	1.99E-04	4.18E-05	1.09E-03	1.41E-03		0.00E+00
Cs-137	6.44E-05	3.48E-02	7.88E-05	2.00E-04	4.20E-05	1.10E-03	1.42E-03	7.80E-02	1.11E-04
Sr-90	5.75E-05	3.11E-02	7.04E-05	1.79E-04	3.76E-05	9.83E-04	1.27E-03	1.50E-01	1.90E-04
Y-90	5.75E-05	3.11E-02	7.04E-05	1.79E-04	3.76E-05	9.83E-04	1.27E-03	1.20E-04	1.52E-07
U-233	2.91E-05	1.57E-02	3.56E-05	9.04E-05	1.90E-05	4.96E-04	6.41E-04	3.00E-01	1.92E-04
Cm-244	1.54E-05	8.29E-03	1.88E-05	4.78E-05	1.00E-05	2.62E-04	3.39E-04	2.20E+00	7.45E-04
H-3[f]	7.52E-06	4.06E-03	9.20E-06	2.34E-05	4.91E-06	1.28E-04	1.66E-04	2.80E-05	4.65E-09
Cs-134	3.16E-06	1.71E-03	3.87E-06	9.84E-06	2.06E-06	5.40E-05	6.98E-05	9.90E-02	6.91E-06
Co-60	2.85E-06	1.54E-03	3.49E-06	8.86E-06	1.86E-06	4.86E-05	6.29E-05	2.50E-02	1.57E-06
Bi-212	7.58E-07	4.09E-04	9.27E-07	2.36E-06	4.95E-07	1.29E-05	1.67E-05	2.30E-03	3.85E-08
C-14[f]	6.78E-08	3.66E-05	8.30E-08	2.11E-07	4.43E-08	1.16E-06	1.50E-06	5.60E-04	8.38E-10
Ce-144	7.72E-07	4.17E-04	9.45E-07	2.40E-06	5.04E-07	1.32E-05	1.70E-05	4.00E-03	6.81E-08
Fe-55	3.22E-08	1.74E-05	3.94E-08	1.00E-07	2.10E-08	5.50E-07	7.10E-07	2.70E-04	1.92E-10
Kr-85	1.95E-07	1.06E-04	2.39E-07	6.08E-07	1.28E-07	3.34E-06	4.31E-06	9.90E-08	4.27E-13
Ni-63	1.02E-07	5.49E-05	1.24E-07	3.16E-07	6.64E-08	1.74E-06	2.24E-06	4.00E-04	8.98E-10
Pb-212	7.58E-07	4.09E-04	9.27E-07	2.36E-06	4.95E-07	1.29E-05	1.67E-05	1.40E-02	2.34E-07
Pm-147	7.78E-07	4.20E-04	9.52E-07	2.42E-06	5.08E-07	1.33E-05	1.72E-05	4.70E-04	8.06E-09
Po-212	4.84E-07	2.62E-04	5.93E-07	1.51E-06	3.16E-07	8.27E-06	1.07E-05	0.00E+00	0.00E+00
Po-216	7.58E-07	4.09E-04	9.27E-07	2.36E-06	4.95E-07	1.29E-05	1.67E-05	5.50E-08	9.20E-13
Pr-144	7.75E-07	4.18E-04	9.48E-07	2.41E-06	5.06E-07	1.32E-05	1.71E-05	1.60E-06	2.74E-11
Ra-224	7.58E-07	4.09E-04	9.27E-07	2.36E-06	4.95E-07	1.29E-05	1.67E-05	2.40E-01	4.01E-06
Sb-125	4.70E-08	2.54E-05	5.75E-08	1.46E-07	3.07E-08	8.03E-07	1.04E-06	2.70E-03	2.80E-09
Th-228	7.58E-07	4.09E-04	9.27E-07	2.36E-06	4.95E-07	1.29E-05	1.67E-05	3.20E+00	5.35E-05
Th-232	2.08E-07	1.12E-04	2.55E-07	6.48E-07	1.36E-07	3.56E-06	4.59E-06	2.10E+00	9.65E-06
Tl-208	2.72E-07	1.47E-04	3.33E-07	8.45E-07	1.77E-07	4.64E-06	6.00E-06	8.20E-06	4.92E-11
U-232	7.41E-07	4.00E-04	9.06E-07	2.30E-06	4.83E-07	1.26E-05	1.63E-05	7.30E-01	1.19E-05
U-234	1.65E-07	8.89E-05	2.02E-07	5.12E-07	1.07E-07	2.81E-06	3.63E-06	3.00E-01	1.09E-06
	Totals =	1.72E-02	4.38E-02	9.19E-03	2.41E-01	3.11E-01	2.88E+01		7.65E-01

a. Radionuclide activity concentration taken from Table 4-1 of the Ravio report. Based upon a total mass of 35,107,163 kg.
b. Based upon an average waste density of 540.11 kg/m3.
c. See section *1.7 - Calculations*, for specific calculations used to obtain these totals.
d. Filtration factor not included (i.e., unabated).
e. Dose to maximum exposed individual at INL boundary, 5,700 m SSW of RWMC, as calculated by CAP-88 code using 10 yr average meteorology from the RWMC met station. See Attachment 1 of Appendix C.
f. No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.

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Table C-4. Continuous Air Monitoring Emissions Estimates for the RCE/ICE and TSA-R CCE

Nuclide	*Average AMWTP Waste Activity Concentration (Ci/kg)*[a]	*Average AMWTP Waste Activity Concentration (Ci/m³)*[b]	*Activity Released From Breached TSA-RE Containers (~~2-Stages HEPA~~RCE) (Ci/yr)*[c]	*Activity Released From Treatment (~~3-Stages HEPA~~ICE/CCE) (Ci/yr)*[c]	*Activity Released From Treatment (~~2-Stages HEPA~~RCE) (Ci/yr)*[c]	*Total Activity Released from TSA-RE (Unabated) (Ci/yr)*[d]	*Unit Ci Dose (mrem/Ci)*[e]	*Total Unabated (mrem/yr)*
Am-241	3.48E-03	1.88E+00	4.54E-02	1.36E-01	2.71E-02	2.08E-01	3.40E+00	7.08E-01
Pu-238	3.30E-03	1.78E+00	4.31E-02	1.29E-01	2.58E-02	1.98E-01	3.80E+00	7.52E-01
Pu-239	1.96E-03	1.06E+00	2.55E-02	7.64E-02	1.53E-02	1.17E-01	4.10E+00	4.81E-01
Pu-240	4.53E-04	2.45E-01	5.91E-03	1.77E-02	3.54E-03	2.71E-02	4.10E+00	1.11E-01
Pu-242	2.96E-08	1.60E-05	3.87E-07	1.16E-06	2.31E-07	1.77E-06	3.90E+00	6.92E-06
Pu-241	4.59E-03	2.48E+00	5.99E-02	1.79E-01	3.58E-02	2.75E-01	7.40E-02	2.03E-02
Ba-137m	6.41E-05	3.46E-02	8.37E-04	2.50E-03	5.00E-04	3.84E-03	0.00E+00	0.00E+00
Cs-137	6.44E-05	3.48E-02	8.40E-04	2.51E-03	5.03E-04	3.86E-03	7.80E-02	3.01E-04
Sr-90	5.75E-05	3.11E-02	7.51E-04	2.25E-03	4.49E-04	3.45E-03	1.50E-01	5.17E-04
Y-90	5.75E-05	3.11E-02	7.51E-04	2.25E-03	4.49E-04	3.45E-03	1.20E-04	4.14E-07
U-233	2.91E-05	1.57E-02	3.79E-04	1.13E-03	2.27E-04	1.74E-03	3.00E-01	5.22E-04
Cm-244	1.54E-05	8.29E-03	2.00E-04	5.99E-04	1.20E-04	9.20E-04	2.20E+00	2.02E-03
H-3[f]	7.52E-06	4.06E-03	9.82E-05	2.94E-04	5.87E-05	4.50E-04	2.80E-05	1.26E-08
Cs-134	3.16E-06	1.71E-03	4.13E-05	1.23E-04	2.47E-05	1.89E-04	9.90E-02	1.87E-05
Co-60	2.85E-06	1.54E-03	3.72E-05	1.11E-04	2.22E-05	1.71E-04	2.50E-02	4.27E-06
Bi-212	7.58E-07	4.09E-04	9.89E-06	2.96E-05	5.92E-06	4.54E-05	2.30E-03	1.04E-07
C-14[f]	6.78E-08	3.66E-05	8.85E-07	2.65E-06	5.29E-07	4.06E-06	5.60E-04	2.27E-09
Ce-144	7.72E-07	4.17E-04	1.01E-05	3.01E-05	6.03E-06	4.62E-05	4.00E-03	1.85E-07
Fe-55	3.22E-08	1.74E-05	4.20E-07	1.26E-06	2.51E-07	1.93E-06	2.70E-04	5.21E-10
Kr-85	1.95E-07	1.06E-04	2.55E-06	7.63E-06	1.53E-06	1.17E-05	9.90E-08	1.16E-12
Ni-63	1.02E-07	5.49E-05	1.33E-06	3.97E-06	7.94E-07	6.09E-06	4.00E-04	2.44E-09
Pb-212	7.58E-07	4.09E-04	9.89E-06	2.96E-05	5.92E-06	4.54E-05	1.40E-02	6.35E-07
Pm-147	7.78E-07	4.20E-04	1.02E-05	3.04E-05	6.07E-06	4.66E-05	4.70E-04	2.19E-08
Po-212	4.84E-07	2.62E-04	6.32E-06	1.89E-05	3.78E-06	2.90E-05	0.00E+00	0.00E+00
Po-216	7.58E-07	4.09E-04	9.89E-06	2.96E-05	5.92E-06	4.54E-05	5.50E-08	2.50E-12
Pr-144	7.75E-07	4.18E-04	1.01E-05	3.02E-05	6.05E-06	4.64E-05	1.60E-06	7.43E-11
Ra-224	7.58E-07	4.09E-04	9.89E-06	2.96E-05	5.92E-06	4.54E-05	2.40E-01	1.09E-05
Sb-125	4.70E-08	2.54E-05	6.14E-07	1.83E-06	3.67E-07	2.82E-06	2.70E-03	7.60E-09
Th-228	7.58E-07	4.09E-04	9.89E-06	2.96E-05	5.92E-06	4.54E-05	3.20E+00	1.45E-04
Th-232	2.08E-07	1.12E-04	2.72E-06	8.13E-06	1.63E-06	1.25E-05	2.10E+00	2.62E-05
Tl-208	2.72E-07	1.47E-04	3.55E-06	1.06E-05	2.12E-06	1.63E-05	8.20E-06	1.33E-10
U-232	7.41E-07	4.00E-04	9.67E-06	2.89E-05	5.78E-06	4.44E-05	7.30E-01	3.24E-05
U-234	1.65E-07	8.89E-05	2.15E-06	6.43E-06	1.29E-06	9.86E-06	3.00E-01	2.96E-06
	Totals =	**1.72E-02**	**1.84E-01**	**5.50E-01**	**1.10E-01**	**8.44E-01**	**2.88E+01**	**2.08E+00**

a. *Radionuclide activity concentration taken from Table 4-1 of the ~~Ravio~~ Raivo report. Based upon a total mass of 35,107,163 kg.*
b. *Based upon an average waste density of 540.11 kg/m3.*
c. *See section 1.7 - Calculations, for specific calculations used to obtain these totals.*
d. *Filtration factor not included (i.e., unabated).*
e. *Dose to maximum exposed individual at INL boundary, 5,700 m SSW of RWMC, as calculated by CAP-88 code using 10 yr average meteorology from the RWMC met station. See Attachment 1 of Appendix C.*
f. *No consideration was given for HEPA filtration in abated radiological emissions of radionuclides H-3 and C-14.*

2.0 DOSE SUMMARY

The maximum individual dose at the Southern INL boundary, the most conservative location at which the public could be exposed to radioactive emissions from the RCE/ICE *and TSA-R CCE*, was calculated using the CAP88-PC computer code. This receptor location represents the hypothetical, worst-case ~~maximum~~ *maximally* exposed individual (MEI) for the RCE/ICE *and TSA-R CCE* and bounds any dose that would be received by an actual receptor (Staley, 1998). Based on the potential abated radionuclide releases, the EDE for that location is *4.84E04*~~4.16E-05~~ mrem/yr.

2.1 Monitoring of Radionuclide Emissions

The NESHAP analysis determined that monitoring of the radioactive air emissions from the RCE/ICE *and TSA-R CCE* is required, since the calculated unabated dose of *2.08E+00*~~7.65E-01~~ mrem/yr does exceed 0.1 mrem/yr (40 CFR 61 Subpart H). As shown in Table C-5, the majority of the dose is attributed to Am-241, Pu-238, Pu-239, and Pu-240. Monitoring of emissions for hazardous air pollutants will be continuously performed with a fixed emissions monitoring system, configured in accordance with ANSI Standard N13.1-1999.

2.2 Maintenance/Testing

A maintenance program will be followed to ensure that ventilation equipment is functioning as required. The efficiency of each HEPA filter routinely will be tested (annually and/or after a filter has been replaced) according to American Society of Mechanical Engineers (ASME) N510-2007, Section 9 standards.

2.3 Recordkeeping and Reporting.

Measurements and data correspondence relating to sampling or monitoring systems, performance testing measurements, equipment calibration checks, and maintenance performed on the systems or equipment will be kept in accordance with the AMWTP quality assurance program. Radionuclide emissions will be reported annually in the INL NESHAP radionuclide reports in compliance with 40 CFR 61.94. Records documenting radionuclide emission input parameters, calculations, analytical methods, and the procedure used to determine the EDE will be maintained at the RWMC for 5 years, to demonstrate compliance with 40 CFR 61.95.

Table C-5. Summary of Abated and Unabated Doses from the TSA-RE at the INL Southern Boundary (South-SouthWest)

Radionuclide	Unabated Dose[a] (mrem/yr)	Abated Dose[b] (mrem/yr)
Am-241	2.61E-01	1.42E-05
Pu-238	2.77E-01	1.51E-05
Pu-239	1.77E-01	9.63E-06
Pu-240	4.10E-02	2.23E-06
Pu-242	2.55E-06	1.39E-10
Pu-241	7.49E-03	4.07E-07
Ba-137m	0.00E+00	0.00E+00
Cs-137	1.11E-04	6.03E-09
Sr-90	1.90E-04	1.04E-08
Y-90	1.52E-07	8.28E-12
U-233	1.92E-04	1.05E-08
Cm-244	7.45E-04	4.05E-08
H-3	4.65E-09	3.66E-08
Cs-134	6.91E-06	3.76E-10
Co-60	1.57E-06	8.54E-11
Bi-212	3.85E-08	2.09E-12
C-14	8.38E-10	6.60E-09
Ce-144	6.81E-08	3.70E-12
Fe-55	1.92E-10	1.04E-14
Kr-85	4.27E-13	2.32E-17
Ni-63	8.98E-10	4.88E-14
Pb-212	2.34E-07	1.27E-11
Pm-147	8.06E-09	4.39E-13
Po-212	0.00E+00	0.00E+00
Po-216	9.20E-13	5.00E-17
Pr-144	2.74E-11	1.49E-15
Ra-224	4.01E-06	2.18E-10
Sb-125	2.80E-09	1.52E-13
Th-228	5.35E-05	2.91E-09
Th-232	9.65E-06	5.25E-10
Tl-208	4.92E-11	2.67E-15
U-232	1.19E-05	6.49E-10
U-234	1.09E-06	5.93E-11
Total	**7.65E-01**	**4.16E-05**

a. The value for the unabated dose is the result of taking no filtration into account and considering the release factor for liquids to be 1E-04 instead of 1E-03. Details provided in Table C-4.

b. The value for the abated dose was treated in the same manner as that for the unabated dose, except that the release factor for liquids was considered to be 1E-03 and accounting for HEPA filtration. Details provided in Table C-2 and Table C-3.

Table C-5. Summary of Abated and Unabated Doses from the TSA-RE at the INL Southern Boundary (South-SouthWest)

Radionuclide	*Unabated Dose[a] (mrem/yr)*	*Abated Dose[b] (mrem/yr)*
Am-241	7.08E-01	1.65E-04
Pu-238	7.52E-01	1.75E-04
Pu-239	4.81E-01	1.12E-04
Pu-240	1.11E-01	2.59E-05
Pu-242	6.92E-06	1.61E-09
Pu-241	2.03E-02	4.74E-06
Ba-137m	0.00E+00	0.00E+00
Cs-137	3.01E-04	7.01E-08
Sr-90	5.17E-04	1.21E-07
Y-90	4.14E-07	9.64E-11
U-233	5.22E-04	1.22E-07
Cm-244	2.02E-03	4.72E-07
H-3	1.26E-08	4.44E-08
Cs-134	1.87E-05	4.37E-09
Co-60	4.27E-06	9.95E-10
Bi-212	1.04E-07	2.43E-11
C-14	2.27E-09	8.01E-09
Ce-144	1.85E-07	4.31E-11
Fe-55	5.21E-10	1.21E-13
Kr-85	1.16E-12	2.70E-16
Ni-63	2.44E-09	5.68E-13
Pb-212	6.35E-07	1.48E-10
Pm-147	2.19E-08	5.11E-12
Po-212	0.00E+00	0.00E+00
Po-216	2.50E-12	5.82E-16
Pr-144	7.43E-11	1.73E-14
Ra-224	1.09E-05	2.54E-09
Sb-125	7.60E-09	1.77E-12
Th-228	1.45E-04	3.39E-08
Th-232	2.62E-05	6.11E-09
Tl-208	1.33E-10	3.11E-14
U-232	3.24E-05	7.55E-09
U-234	2.96E-06	6.90E-10
Total	**2.08E+00**	**4.84E-04**

a. The value for the unabated dose is the result of taking no filtration into account and considering the release factor for liquids to be 1E-04 instead of 1E-03. Details provided in Table C-4.

b. The value for the abated dose was treated in the same manner as that for the unabated dose, except that the release factor for liquids was considered to be 1E-03 and accounting for HEPA filtration. Details provided in Table C-2 and Table C-3.

REFERENCES

1. ~~Ravio~~*Raivo*, B.D., Becker, G.K., Smithe, T.H., and Anderson, G.L. *Waste Description Information for Transuranically-Contaminated Wastes Stored at the Idaho National Engineering Laboratory*, INEL-95/0412, December 1995.

2. Staley, C. S. & Abbott, M. L., *INEEL Air Modeling Protocol* LMITCO Integrated Earth Sciences February, 1998 Draft.

3. ANSI-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*, ANSI N-13.1-1999.

ATTACHMENT 1. CAP88 DOSES FROM THE ADVANCED MIXED WASTE TREATMENT PROJECT AT MAXIMUM SITE BOUNDARY

CAP88 Doses from the Advanced Mixed Waste Treatment Project at Maximum Site Boundary

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May 3, 2010, Updated May 18, 2010

Introduction

This report documents the methodology to calculate effective dose equivalent (EDE) to the Maximally Exposed Individual (MEI) on the site boundary from releases at the Advanced Mixed Waste Treatment Project (AMWTP). These calculations are done in accordance with the requirements stated in 40 *Code of Federal Regulations* (CFR) Part 61.94, National Emission Standards for Hazardous Air Pollutants (NESHAPS). The regulations state, "Computer models CAP88 and AIRDOS-PC are approved for calculating effective dose equivalents...". The EPA SCRAM website states you may use any of the three versions of CAP-88 (CAP88-PC, CAP88 mainframe, and AIRDOSE PC), but CAP88-PC Version 3 is recommended. Doses were calculated for 35 radionuclides provided as the source for this facility from the 2009 annual NESHAPS report. These calculations differ from the NESHAPS calculation in that the MEI in these calculations is located at the southern site boundary (5700 m SSW of the AMWTP) instead of the MEI location identified in the NESHAPS annual report as Frenchman Cabin, which is located 7976 m SSW of the RWMC. The site boundary location is not occupied, but was identified in Staley et al. (2004) as the location of highest dose on the site boundary.

CAP88PC-3 Modeling

The CAP88-PC modeling was performed using the methodology stated in Staley et al. (2004). The modeling entailed calculating annual doses for unit emission rates for the 35 radionuclides at the MEI location. The 2009 meteorological data file for the Radioactive Waste Management Complex (RWMC) provided by the Idaho Falls Office of the National Oceanic and Atmospheric Administration (NOAA) was used in the calculation (file RWMCL09.WND, Appendix A). The EPA default radionuclide-independent parameters used in CAP88 for the rural receptor scenario are provided in Table 1 and Table 2.

Table 1. Radionuclide-independent parameters for the rural receptor.

Description	Value	Units
Inhalation rate	9.17E+05	cm^3/hr
Effective surface density (15 cm plow depth, dry weight)	2.15E+02	kg/m^2
Build-up time for radionuclides in soil	1.00E+02	year
Build-up time radionuclides deposited on ground/water	3.65E+02	day
Delay time, ingestion of pasture grass by animals	0.00E+00	hr
Delay time, Ingestion of stored feed by animals	2.16E+03	hr
Delay time, Ingestion of leafy vegetables by man	3.36E+02	hr
Delay time, Ingestion of produce by man	3.36E+02	hr
Delay time, Transport time from animal feed-milk-man	2.00E+00	day
Delay time, Time from slaughter to consumption	2.00E+01	day
Removal rate constant for physical loss	2.90E-03	1/hr
Crop exposure duration, pasture grass	7.20E+02	hr
Crop exposure duration, crops, leafy vegetables	1.44E+03	hr
Ag Productivity, Grass-cow-milk-man pathway	2.80E-01	kg/m^2
Ag Productivity, produce/leafy veg for human consumption	7.16E-01	kg/m^2
Fallout interception fraction, vegetables	2.00E-01	---
Fallout interception fraction, pasture	5.70E-01	---
Fraction of year animals graze on pasture	4.00E-01	---
Fraction of daily feed that is pasture grass (when animal is on pasture	4.30E-01	---
Animal consumption of contaminated feed/forage (dry weight)	1.56E+01	kg/day
Milk production of cow	1.10E+01	L/day
Muscle mass of animal at slaughter	2.00E+02	kg
Fraction of herd slaughtered	3.81E-03	1/day
Fraction of radioactivity retained after washing (leafy veg and produce)	5.00E-01	---
Fraction of produce ingested grown in garden	1.00E+00	---
Fraction of leafy vegetables ingested grown in garden	1.00E+00	---
Ingestion ratios, vegetables, immediate area/total within area	7.00E-01	---
Ingestion ratios, meat, immediate area/total within area	4.40E-01	
Ingestion ratios, milk, immediate area/total within area	4.00E-01	
Minimum ingestion fractions from outside area, vegetables	0.00E+00	
Minimum ingestion fractions from outside area, meat	0.00E+00	
Minimum ingestion fractions from outside area, milk	0.00E+00	
Human produce ingestion	1.76E_02	kg/yr
Human milk ingestion	1.12E+02	L/yr
Human meat ingestion	8.5E+01	kg/yr
Human vegetable ingestion	1.80E+01	kg/yr
Fraction of time spent swimming	0.00E+00	
Dilution factor for water	1.00E+00	cm

Table 2. Other meteorological parameters used in the CAP88 model. These values represent a 10-year average at the INL (Clawson et al. 1989).

Variable	Value	Units
Lid height	800	meters
Mean temperature	280.2	Kelvin
Precipitation	20.8	cm/yr
Absolute humidity	3.54	g/m^3

Unit Dose Factors

The unit dose factor (*UDF*) is the annual dose for a given radionuclide at a given location and for a given source per unit release, and is given by

$$UDF_{i,j,k} = \frac{D_{i,j,k}}{Q_i} \qquad (1)$$

where

$UDF_{i,j,k}$ = unit dose factor for radionuclide *i*, including progeny at receptor *j*, and from source *k* (mrem per Ci)

$D_{i,j,k}$ = CAP88 total pathway parent/progeny annual Effective Dose Equivalent (EDE) for radionuclide *i*, receptor *j*, and source *k* (mrem/yr)

Q_i = unit release rate for radionuclide *i*, (1 Ci/yr)

CAP88 was run for each radionuclide using a unit emission rate (1 Ci/yr). The release height was conservatively assumed to be from a ground-level point source. The product of the unit dose factor and the reported release rate provided an estimate of the annual dose.

Source Term

The source term (Table 3) was provided by AMWTP as part of the annual 2009 NESHAPS reporting. The source term represents the sum of releases from building WMF-634, WMF-636, WMF-628-002, and WMF-615. Unit dose factors were also calculated for some nuclides that have no reported release.

Results

Unit dose factors and annual doses at the site boundary MEI location (5700 m SSW) are provided in Table 3. The maximum total dose was 2.3E-05 mrem/yr. Radionuclides with no reported release for 2009 were assigned a release rate of zero.

Table 3. AMWTP source term, unit doses at 5700 m SSW MEI location, and estimated doses at the MEI.

Radionuclide	Release (Ci/yr)	Unit Dose (mrem/yr per Ci released)	Annual Dose (mrem/yr)
Am-241	2.64E-06	3.40E+00	9.0E-06
Am-243	0.00E+00	3.40E+00	0.0E+00
Ba-133	0.00E+00	2.50E-03	0.0E+00
Be-7	1.54E-13	8.80E-05	1.4E-17
Bi-212	2.87E-10	2.30E-03	6.6E-13
C-14	6.53E-11	5.60E-04	3.7E-14
Ce-144	2.93E-10	4.00E-03	1.2E-12
Cf-249	0.00E+00	5.80E+00	0.0E+00
Cm-243	0.00E+00	2.60E+00	0.0E+00
Cm-244	5.82E-09	2.20E+00	1.3E-08
Co-60	1.08E-09	2.50E-02	2.7E-11
Cs-134	1.20E-09	9.90E-02	1.2E-10
Cs-137	2.44E-08	7.80E-02	1.9E-09
Eu-152	0.00E+00	8.70E-03	0.0E+00
Eu-154	0.00E+00	1.00E-02	0.0E+00
Fe-55	1.22E-11	2.70E-04	3.3E-15
H-3	7.24E-09	2.80E-05	2.0E-13
K-40	2.06E-13	4.50E-02	9.3E-15
Kr-85	7.41E-11	9.90E-08	7.3E-18
Na-22	0.00E+00	2.00E-02	0.0E+00
Nb-94	0.00E+00	8.40E-03	0.0E+00
Ni-63	3.85E-11	4.00E-04	1.5E-14
Np-237	0.00E+00	1.90E+00	0.0E+00
Pb-210	4.65E-14	3.20E-01	1.5E-14
Pb-212	2.87E-10	1.40E-02	4.0E-12
Pm-147	2.95E-10	4.70E-04	1.4E-13
Po-212	1.84E-10	0.00E+00	0.0E+00
Po-216	2.87E-10	5.50E-08	1.6E-17
Pr-144	2.94E-10	1.60E-06	4.7E-16
Pu-238	8.61E-07	3.80E+00	3.3E-06
Pu-239	1.39E-06	4.10E+00	5.7E-06
Pu-240	1.24E-06	4.10E+00	5.1E-06
Pu-241	4.54E-07	7.40E-02	3.4E-08
Pu-242	3.33E-12	3.90E+00	1.3E-11
Ra-224	2.87E-10	2.40E-01	6.9E-11
Ra-226	0.00E+00	4.70E-01	0.0E+00
Sb-125	1.78E-11	2.70E-03	4.8E-14
Sr-90	2.18E-08	1.50E-01	3.3E-09
Th-228	2.87E-10	3.20E+00	9.2E-10
Th-232	7.89E-11	2.10E+00	1.7E-10
Tl-208	1.03E-10	8.20E-06	8.4E-16
U-232	2.81E-10	7.30E-01	2.0E-10
U-233	1.10E-08	3.00E-01	3.3E-09
U-234	6.24E-11	3.00E-01	1.9E-11

U-235	0.00E+00	2.60E-01	0.0E+00
U-238	0.00E+00	2.40E-01	0.0E+00
Y-90	2.18E-08	1.20E-04	2.6E-12
Total			2.31E-05

References

Clawson, K.L., G.E. Start, and N.R. Ricks, 1989. *Climatography of the Idaho National Engineering Laboratory*. DOE/ID-12118. National Oceanic and Atmospheric Administration, Field Research Division, Idaho Falls, ID 83402.

EPA (U.S. Environmental Protection Agency) 2007. *CAP88-PC Version 3 User's Guide*. U.S. EPA, Office of Radiation and Indoor Air, Ariel Rios Building, Washington DC.

Staley, C.S., M.L. Abbott, and P.D. Ritter, 2004. INEEL Air Modeling Protocol. INEEL/EXT-04-02511.

Appendix A: Meteorological Wind Files

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RWMCL09.WND
   4.13714
 .0360 .0226 .0172 .0144 .0251 .0442 .1115 .0520 .0242 .0220 .0291 .0575 .0866 .1126 .2062 .1388
1.5611.4971.5091.2211.3201.5561.475 .919 .987 .9651.018 .9821.016 .9311.2371.558
3.3082.6542.9392.4352.3742.7212.3811.3881.7091.1601.0391.2821.5561.6732.0902.374
4.1863.4544.5323.8323.3653.5113.1771.7931.7841.1371.5121.5311.5812.3743.7424.341
4.0344.2333.6112.9883.2643.4543.9383.3642.9353.0532.9912.5712.1803.9645.5765.223
1.4682.2601.8451.2111.7072.2992.4832.6551.6941.5311.2261.2121.1611.6912.8573.437
1.2751.0371.0251.0371.0211.0631.0221.1751.105 .946 .983 .953 .926 .9661.0101.091
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
2.0722.0182.0291.7181.8402.0681.9981.1851.3341.2871.3931.3221.3911.2121.7402.070
3.5453.2083.7292.9812.9793.1592.9452.2082.4332.2371.6852.1422.5102.6323.1703.085
4.4774.3894.8994.0103.6034.1023.7602.7463.4621.8132.6282.8112.7314.1364.6614.774
5.2674.8394.0023.6414.1284.5715.1624.8323.9384.4974.4294.0793.7346.6787.2976.177
2.3802.7372.2681.8552.4573.0663.2253.3172.3512.1701.9721.8681.7862.6443.5483.837
1.7871.4301.4081.4301.3991.4771.4011.6541.5481.2461.3241.2601.2001.2901.3791.525
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
     .2358     .1213     .1213     .3313     .0624     .1279     .0000
     .4081     .0890     .0996     .2302     .0580     .1151     .0000
     .3631     .0957     .0754     .1914     .0412     .2332     .0000
     .3114     .1068     .0825     .2372     .0818     .1803     .0000
     .2784     .1041     .0662     .2736     .0750     .2026     .0000
     .2004     .1312     .1230     .3341     .0882     .1230     .0000
     .0731     .0614     .1684     .5117     .1431     .0423     .0000
     .0796     .0456     .0682     .4387     .2522     .1157     .0000
     .1560     .0586     .0487     .3269     .1610     .2489     .0000
     .1129     .0269     .0378     .2418     .1935     .3871     .0000
     .1056     .0244     .0568     .3089     .1465     .3578     .0000
     .0739     .0349     .0224     .2936     .1888     .3863     .0000
     .0436     .0368     .0450     .3370     .2278     .3097     .0000
     .0472     .0294     .0473     .5876     .1573     .1311     .0000
     .0309     .0241     .0757     .6808     .1427     .0458     .0000
     .0578     .0655     .1124     .5889     .1285     .0468     .0000
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APPENDIX D. EMISSION CALCULATIONS

Waste Stream Description

Source Emission Calculations

Table D-1. Wastes Remaining in the TSA by Waste Category[a,b]

Generator	IDC	Stream Name	EPA Haz. Waste Numbers	Waste Cat.
			Debris Wastes:	
RFETS	371	Brick, Fire	D004-D011, D022 D028, D029, F001-F003, F005	CBD
		Composite CBD HWNs	D004-D011, D022 D028, D029, F001-F003, F005	
RFETS	300	Graphite Molds	D008, D028, D029, F001, F002, F005	G
RFETS	310	Graphite Scarfings	D008, D029, F001, F002, F005	G
RFETS	311	Graphite Heels	TBD	G
		Composite Graphite HWNs	D008, D028, D029, F001, F002, F005	
RFETS	241	Americium Process Residue	D008, F002, F003	HD
RFETS	750	Pits 11 & 12 Debris (from RF facility)	TBD	HD
RFETS	752	Pits 11 & 12 Debris Waste (non RF)	TBD	HD
RFETS	950	LSA Metal, Glass, etc.	F001, F002	HD
RFETS	960	Concrete, Asphalt, etc.	TBD	HD
		Composite HD HWNs	D008, F001-F003	
RFETS	335	Filters, Absolute 8 x 8	D004-D009, D022, D028, D029, F001, F002, F005-F007, F009	ID
RFETS	360	Insulation	D004-D011, D022, D028, D029, F001, F002, F006	ID
RFETS	441	Raschig Rings, Unleached	D008, D009, D022, F001, F002, F005	ID
RFETS	442	Raschig Rings, Leached	D009, D009, D022, F001, F002, F005	ID
RFETS	490	Filters, CWS	D004-D011, D022, D028, D029, F001, F002, F005	ID
		Composite ID HWNs	D004-D011, D022, D029, D028, F001, F002, F005-F007	
RFETS	320	Heavy Nonspecial Source Metal	D004-D011, D028, D029, F001, F002, F005	MD
RFETS	480	Metal, Scrap (Nonspecial Source)	D004-D011, D022, D028, D029, F001-F003, F005-F007, F009	MD
RFETS	481	Metal, Leached (Nonspecial Source)	D004-D011, D022, D028, D029, F001-F003, F005-F007, F009	MD
		Composite MD HWNs	D004-D011, D022, D028, D029, F001-F003, F005-F007, F009	
RFETS	464	Benelex and Plexiglas	D008	OD
RFETS	970	Wood	D008, F001-F003	OD
		Composite OD HWNs	D008, F001-F003	
RFETS	330	Paper and Rags-Dry	D004-D011, D022, D028, D029, F001-F003, F005-F007, F009	PRPR
RFETS	336	Paper and Rags-Moist	D004-D011, D028, D029, F001-F003, F005-F007, F009	PRPR
RFETS	337	Plastic, Teflon, Wash, PVC	D004-D011, D028, D029, F001-F003, F005-F007, F009	PRPR

Table D-1. Wastes Remaining in the TSA by Waste Category[a,b]

Generator	IDC	Stream Name	EPA Haz. Waste Numbers	Waste Cat.
RFETS	430	Resin, Ion Column Unleached	TBD	OHS
RFETS	431	Resin, Leached	TBD	OHS
RFETS	460	Washables, Rubber, Plastics	TBD	PRPR
RFETS	463	Leaded Rubber Gloves and Aprons	D008, D022, D028, D029, F001, F002, F005-F007, F009	PRPR
RFETS	900	LSA Paper, Plastic, etc.	D008, F001-F003	PRPR
		Composite PRPR HWNs	D004-D011, D022, D028, D029, F001-F003, F005-F007, F009	
		Non-Debris Wastes:		
RFETS	001	First Stage Sludge	D004-D011, D022, F001-F003, F005-F007, F009	IHS
RFETS	002	Second Stage Sludge	D004-D011, D022, F001-F003, F005-F007, F009	IHS
RFETS	004	Special Setups (Cement)	D006- D009, D011, D029, F001-F003, F005-F007, F009	IHS
RFETS	005	Evaporated Salts	TBD	IHS
RFETS	290	Sludge, Filter	TBD	IHS
RFETS	370	Crucible, LECO	TBD	IHS
RFETS	391	Crucible and Sand	TBD	IHS
RFETS	392	Sand, Slag, and Crucibles	TBD	IHS
RFETS	420	Ash, Incinerator (Virgin)	D004-D011, F001, F002, F005	IHS
RFETS	422	Soot	D004-D011, F001, F002, F005	IHS
RFETS	440	Glass	D001, D002, D005, D008, D009, D022, D028, D029, F001, F002, F005	IHS
RFETS	741	Pits 11 & 12 First Stage Sludge	TBD	IHS
RFETS	742	Pits 11 & 12 Second Stage Sludge	TBD	IHS
RFETS	744	Pits 11 & 12 Special Setups	TBD	IHS
RFETS	751	Pits 11 & 12 Roaster Oxide	TBD	IHS
		Composite IHS HWNs	D004-D011,D022, D028,D029,F001-F003,F005-F007,F009	
RFETS	003	Organic Setups, Oil Solids	D009-D011, D022, D026-D030, D032, D034, D036, D037, F001-F003,F005, PCBs	OHS
RFETS	095	Sewer Sludge	TBD	OHS
RFETS	743	Pits 11 & 12 Organic Setups	TBD, PCBs	OHS
RFETS	745	Pits 11 & 12 Evaporator Salts	TBD	TBD
RFETS	749	Pits 11 & 12 Sewer Sludge	TBD	OHS
RFETS	995	Sewer Sludge	TBD, PCBs	OHS
		Composite OHS HWNs	D009-D011, D022, D026-D030, D032, D034, D036, D037, F001-F003,F005, PCBs	
RFETS	090	Dirt	TBD	S
RFETS	990	Dirt	TBD	S
		Composite Soil HWNs	None	

Table D-1. Wastes Remaining in the TSA by Waste Category[a,b]

Generator	IDC	Stream Name	EPA Haz. Waste Numbers	Waste Cat.
		Waste Categories to be Determined:		
Various	000	Not Recorded-Unknown	Unknown	TBD

a. EPA HWNs were assigned based on TRUW-12, Rev. 15, *AMWTP Waste Stream Designations.* Waste streams listed with "none" in the "EPA Haz. Waste Numbers" column are radioactive-only wastes (i.e., nonhazardous). Waste streams listed with "TBD" were not assigned any HWNs based on available Acceptable Knowledge or Characterization. The final list of HWNs may be determined at a later when characterization data becomes available.

b. Waste streams RF-003, RF-743 & RF-995 are currently identified as PCB waste streams.

Table D-2. Total PM from RCE/ICE Operations

Operation	Container Type	Process Rate[a]	Containers Breached[b]	Waste Density[c]	Waste Throughput[d]	Emission Factor[e]	HEPA Filters[f,g]	Total PM Emitted[h]
	-	(55-gal de/day)	%	(lb/dm)	(ton/hr)	lb/ton	-	(lb/hr)
Drum Retrieval	55-gal drum equivalent	150	10%	525	0.1641	0.0048	1.00E-06	7.88E-10
Box Retrieval	Boxes	152.5	25%	525	0.4170	0.0048	1.00E-09	2.00E-12
Cargo Container Retrieval	55-gal drum equivalent	80	10%	525	0.0875	0.0048	1.00E-06	4.20E-10
Contaminated Soil Removal	55-gal drum equivalent	3	100%	687	0.0429	0.0048	1.00E-06	2.06E-10
Liquid Treatment	55-gal drum equivalent	30	100%	525	0.3281	0.0048	1.00E-09	1.58E-12
Repackaging/Sizing of Waste	55-gal drum equivalent	40	100%	525	0.4375	0.0048	1.00E-09	2.10E-12
							Total Contaminated PM Emitted =	1.42E-09
Non-Contaminated Soil Removal	55-gal drum equivalent	50	100%	687	0.716	0.0048	1.00E-06	3.44E-09
							Total Non-Contaminated PM Emitted =	3.44E-09

a. A standard size box is 3.172 m^3/box. A retrieval rate of 10 boxes per day equates to 152.5 55-gal drums/day. The soil process rate is based on an estimated volume of soil equal to 4,000 m^3 (~19,230 55 gal de) remaining to be removed during retrieval operations. Assuming all soil is removed within one year, it is assumed that 53 55-gal de/day of soil will be removed. Based on the retrieval of previous soil removal activities (~36,000 m^3), contaminated soil makes up less than 3% of the total volume. Therefore, a conservative 5% soil contamination rate was used (3 55-gal de/dy contaminated soil, 50 55-gal de/dy non-contaminated soil).

b. It is conservatively assumed that approximately 10% of 55-gal drums and 25% of boxes are breached to the extent that the waste is exposed. Cargo containers contain drums, therefore it was assumed that 10% of the containers within the cargo are breached.

c. Non-debris waste density used for overall waste density for conservatism, as non-debris has a higher density than debris waste. Waste density is based upon average value calculated from Ravio report. The soil density was based on an average soil density of 1.5 g/cm^3.

d. Waste Throughput (Ton/hr) = Process Rate (dm/day) x Waste Density (lb/dm) x Containers Breached (%) / (2000 lb/ton x 24 hr/day)

e. Worst-case PM emissions are assumed to be generated at a conservative rate of 0.0048 lb emitted per ton processed. This value was determined from an emission rate for concrete batching (i.e., 0.0048 lb/ton), which is provided in Table 11.12-2 of AP-42, Emission Factors for Concrete Batching (Weigh hopper loading). Concrete batching is a much dustier operation than any of the operations performed in WMF-636. Therefore, the calculations of PM-10 emitted are conservative.

f. Two HEPA filters are located on the RCE for drum and cargo container retrieval which provides a PM removal efficiency of 1.0E-06 (99.9% per filter).

g. Three HEPA filters are located on the ICE (or other equivalent area) for the retrieval of boxes, treatment of liquids, and repackaging/sizing of waste. This provides a PM removal efficiency of 1.0E-09 (99.9% per filter).

h. Total PM Emitted (lb/hr) = Waste Throughput (ton/hr) x Emission Factor (lb/ton) x HEPA Filters.

i. The non-contaminated soil was only included for purposes of calculating PM/PM-10 emissions. For conservative purposes, the suppression provided by dust suppression via water or surfactants were not credited.

Table D-2. Total PM from RCE/ICE and TSA-R CCE Operations

Operation	Container Type	Process Rate[a] (55 gal de/day)	Containers Breached (%)	Waste Density[b] (lb/dm)	Waste Throughput[c] (ton/hr)	Emission Factor[d] (lb/ton)	HEPA Filters[e,f]	Total PM Emitted[g] (lb/hr)
Retrieval	55-gal drum equivalent	160	100%	525	1.7500	0.0048	1.00E-06	8.40E-09
Contaminated Soil Removal	55-gal drum equivalent	3	100%	687	0.0429	0.0048	1.00E-06	2.06E-10
Liquid Treatment	55-gal drum equivalent	16	100%	525	0.1750	0.0048	1.00E-06	8.40E-10
Repackaging/Sizing of Waste	55-gal drum equivalent	176	100%	525	1.9250	0.0048	1.00E-06	9.24E-09
							Total Contaminated PM Emitted =	**1.87E-08**
Non-Contaminated Soil Removal[h]	55-gal drum equivalent	50	100%	687	0.716	0.0048	1.00E-06	3.44E-09
							Total Non-Contaminated PM Emitted =	**3.44E-09**

a. A standard size box is 3.172 m^3/box. A retrieval rate equates to 160 55-gal drums/day. The soil process rate is based on an estimated volume of soil equal to 4,000 m^3 (~19,230 55 gal de) remaining to be removed during retrieval operations. Assuming all soil is removed within one year, it is assumed that 53 55-gal de/day of soil will be removed. Based on the retrieval of previous soil removal activities (~36,000 m^3), contaminated soil makes up less than 3% of the total volume. Therefore, a conservative 5% soil contamination rate was used (3 55-gal de/dy contaminated soil, 50 55-gal de/dy non-contaminated soil).

b. Non-debris waste density used for overall waste density for conservatism, as non-debris has a higher density than debris waste. Waste density is based upon average value calculated from Raivo report. The soil density was based on an average soil density of 1.5 g/cm^3.

c. Waste Throughput (Ton/hr) = Process Rate (dm/day) x Waste Density (lb/dm) x Containers Breached (%) / (2000 lb/ton x 24 hr/day)

d. Worst-case PM emissions are assumed to be generated at a conservative rate of 0.0048 lb emitted per ton processed. This value was determined from an emission rate for concrete batching (i.e., 0.0048 lb/ton), which is provided in Table 11.12-2 of AP-42, Emission Factors for Concrete Batching (Weigh hopper loading). Concrete batching is a much dustier operation than any of the operations performed in WMF-636. Therefore, the calculations of PM-10 emitted are conservative.

e. Two HEPA filters are located on the RCE for drum and cargo container retrieval which provides a PM removal efficiency of 1.0E-06 (99.9% per filter).

f. Three HEPA filters are located on the ICE or CCE (or other equivalent area) for the retrieval, treatment or repackaging/sizing of waste. This provides a PM removal efficiency of 1.0E-06 (99.9% per filter). However, for conservative emission estimates, credit was taken for only two stages of HEPA filters.

g. Total PM Emitted (lb/hr) = Waste Throughput (ton/hr) x Emission Factor (lb/ton) x HEPA Filters.

h. The non-contaminated soil was only included for purposes of calculating PM/PM-10 emissions. For conservative purposes, the suppression provided by dust suppression via water or surfactants were not credited.

~~**Table D-3. Total VOCs from RCE/ICE Operations**~~

Operation	Container Type	Process Rate[a]	Containers Breached[b]	Waste Density[c]	Waste Throughput[d]	Liquid Throughput[e,f,g]	Emission Factor[h,i]	Total VOC Emitted[j]
	-	(55-gal de/day)	%	(lb/dm)	(ton/hr)	(ton/hr)	lb/ton	(lb/hr)
Drum Retrieval	55-gal drum equivalent	150	10%	525	0.1641	0.0004	0.02	8.53E-06
Box Retrieval	Boxes	152.5	25%	525	0.4170	0.0011	0.02	2.17E-05
Cargo Container Retrieval	55-gal drum equivalent	80	10%	525	0.0875	0.0002	0.02	4.55E-06
Contaminated Soil Removal	55-gal drum equivalent	3	100%	687	0.0429	0.0001	0.02	2.23E-06
Liquid Treatment	55-gal drum equivalent	30	100%	525	0.3281	0.0164	0.72	1.18E-02
Repackaging/Sizing of Waste	55-gal drum equivalent	40	100%	525	0.4375	0.0011	0.02	2.28E-05
							Total VOCs Emitted =	1.19E-02

a. A standard size box is 3.172 m3/box. A retrieval rate of 10 boxes per day equates to 152.5 55-gal drums/day. The soil process rate is based on an estimated volume of soil equal to 4,000 m3 (~19,230 55 gal de) remaining to be removed during retrieval operations. Assuming all soil is removed within one year, it is assumed that 53 55-gal de/day of soil will be removed. Based on the retrieval of previous soil removal activities (~36,000 m3), contaminated soil makes up less than 3% of the total volume. Therefore, a conservative 5% soil contamination rate was used (3 55-gal de/dy contaminated soil, 50 55-gal de/dy non-contaminated soil).

b. It is conservatively assumed that approximately 10% of 55-gal drums and 25% of boxes are breached to the extent that the waste is exposed. Cargo containers contain drums, therefore it was assumed that 10% of the containers within the cargo are breached.

c. Non-debris waste density used for overall waste density for conservatism, as non-debris has a higher density than debris waste. Waste density is based upon average value calculated from Ravio report.

d. Waste Throughput (Ton/hr) = Process Rate (dm/day) x Waste Density (lb/dm) x Containers Breached (%) / (2000 lb/ton x 24 hr/day)

e. The quantity of liquid for the retrieval of containers and repackaging is assumed to be up to 1% in 26% of the containers; therefore, Liquid Throughput (Retrieval/Repackaging) = 0.01 x .26 x Waste Throughput. This was also assumed for contaminated soil, which is not expected to contain any free liquids. Therefore, the calculations are for contaminated soil is conservative.

f. Sizing of waste is not assumed to occur on any waste with liquids. However, for conservatism, the volume of waste sized is incorporated with the volume of waste repackaged. The volume of liquid for waste repackaged is assumed to be 1% in up to 26% of the containers.

g. The quantity of liquid in the waste stream for the treatment of waste with liquids is assumed to be 5% of the waste volume; therefore, Liquid Throughput = 0.05 x Waste Throughput.

h. Emission factors are from AP-42, Table 4.7-1, Emission Factors for Solvent Reclaiming. Processes treating liquid waste use an emission factor of 0.72 lb VOCs per ton of solvent (liquid). This assumption is considered conservative, as liquids are not mainly VOCs (mostly aqueous or oil).

i. Emission factors are from AP-42, Table 4.7-1, Emission Factors for Solvent Reclaiming. Retrieval processes where liquid waste is not is not disturbed use 0.02 lb/ton (factor for a solvent storage tank). This assumption is considered conservative, as liquids are not mainly VOCs (mostly aqueous or oil).

j. Total VOC Emitted (lb/hr) = Liquid Throughput (ton/hr) x Emission Factor (lb/ton) x HEPA Filters.

Table D-3. Total VOCs from RCE/ICE and TSA-R CCE Operations

Operation	Container Type	Process Rate[a]	Containers Breached	Waste Density[b]	Waste Throughput[c]	Liquid Throughput[d,e,f]	Emission Factor[g,h]	Total VOC Emitted[i]
		(55 gal de/day)	%	(lb/dm)	(ton/hr)	(ton/hr)	lb/ton	(lb/hr)
Retrieval	55-gal drum equivalent	160	100%	525	1.7500	0.0046	0.02	9.10E-05
Contaminated Soil Removal	55-gal drum equivalent	3	100%	687	0.0429	0.0001	0.02	2.23E-06
Liquid Treatment	55-gal drum equivalent	16	100%	525	0.1750	0.0088	0.72	6.30E-03
Repackaging/Sizing of Waste	55-gal drum equivalent	176	100%	525	1.9250	0.0050	0.02	1.00E-04
							Total VOCs Emitted =	**6.49E-03**

a. A standard size box is 3.172 m3/box. A retrieval rate equates to 160 55-gal drums/day. The soil process rate is based on an estimated volume of soil equal to 4,000 m3 (~19,230 55 gal de) remaining to be removed during retrieval operations. Assuming all soil is removed within one year, it is assumed that 53 55-gal de/day of soil will be removed. Based on the retrieval of previous soil removal activities (~36,000 m3), contaminated soil makes up less than 3% of the total volume. Therefore, a conservative 5% soil contamination rate was used (3 55-gal de/dy contaminated soil, 50 55-gal de/dy non-contaminated soil).

b. Non-debris waste density used for overall waste density for conservatism, as non-debris has a higher density than debris waste. Waste density is based upon average value calculated from Raivo report.

c. Waste Throughput (Ton/hr) = Process Rate (dm/day) x Waste Density (lb/dm) x Containers Breached (%) / (2000 lb/ton x 24 hr/day)

d. The quantity of liquid for the retrieval of containers and repackaging is assumed to be up to 1% in 26% of the containers; therefore, Liquid Throughput (Retrieval/Repackaging) = 0.01 x .26 x Waste Throughput. This was also assumed for contaminated soil, which is not expected to contain any free liquids. Therefore, the calculations are for contaminated soil is conservative.

e. Sizing of waste is not assumed to occur on any waste with liquids. However, for conservatism, the volume of waste sized is incorporated with the volume of waste repackaged. The volume of liquid for waste repackaged is assumed to be 1% in up to 26% of the containers.

f. The quantity of liquid in the waste stream for the treatment of waste with liquids is assumed to be 5% of the waste volume; therefore, Liquid Throughput = 0.05 x Waste Throughput.

g. Emission factors are from AP-42, Table 4.7-1, Emission Factors for Solvent Reclaiming. Processes treating liquid waste use an emission factor of 0.72 lb VOCs per ton of solvent (liquid). This assumption is considered conservative, as liquids are not mainly VOCs (mostly aqueous or oil).

h. Emission factors are from AP-42, Table 4.7-1, Emission Factors for Solvent Reclaiming. Retrieval processes where liquid waste is not is not disturbed use 0.02 lb/ton (factor for a solvent storage tank). This assumption is considered conservative, as liquids are not mainly VOCs (mostly aqueous or oil).

i. Total VOC Emitted (lb/hr) = Liquid Throughput (ton/hr) x Emission Factor (lb/ton).

APPENDIX E. AIR DISPERSION MODELING ANALYSIS

AMWTP
Advanced Mixed Waste Treatment Project

Air Quality Modeling Report for the RCE/ICE and the TSA-R Contamination Control Enclosure

Advanced Mixed Waste Treatment Project

Rev. 0*C*

~~January 14~~*April 2*, 2013

CONTENTS

1.0 PURPOSE

This document provides a description and analysis for an air model constructed of the Retrieval Contamination Enclosure/ Interior Contamination Enclosure (RCE/ICE), and the Transuranic Storage Area Pad-R contamination control enclosure (TSA-R CCE), both located within the Transuranic Storage Area – Retrieval Enclosure (TSA-RE). The methods outlined meet the non-radiological pollutant modeling requirements specified by the Idaho Department of Environmental Quality (IDEQ) in Rules for the Control of Air Pollution in Idaho [Idaho Administrative Procedures Act (IDAPA) 58.01.01]. Air modeling for the RCE/ICE and TSA-R CCE, in the context of this document, was performed to estimate concentrations of the pollutants of concern addressed in the National Ambient Air Quality Standards (NAAQS) (IDAPA 58.01.01.575) and the toxic air pollutants (TAPs) listed in IDAPA 58.01.01.585 (non-carcinogens) and 58.01.01.586 (carcinogens).

The air modeling was performed in support of a Permit To Construct (PTC) modification application for the RCE/ICE and TSA-R CCE.

2.0 SUMMARY

2.1 Retrieval Contamination Enclosure

The RCE/ICE and the TSA-R CCE provide engineered controls which preclude the potential for an unacceptable release of airborne contamination, thus making possible the continued retrieval of approximately 6,200 m^3 waste remaining in the TSA-RE. The TSA-RE is located at the Radioactive Waste Management Complex (RWMC) in the southwestern corner of the Idaho National Laboratory (INL) site.

The first stage of removing this waste from the State of Idaho is retrieval of remaining containers from the TSA-RE waste stacks in a safe and compliant manner. Many of the remaining containers are severely degraded, posing worker health and safety concerns as well as those concerning a potential release to the environment. These are some of the oldest containers of the TSA-RE inventory.

The RCE/ICE and TSA-R CCE are each isolated from the primary retrieval enclosure as well as the surrounding environment, employ high-efficiency particulate air (HEPA) filtration, and have individual air spaces within the TSA-RE Pad 1 and TSA-RE Pad R areas (respectively). All releases from the RCE/ICE and the TSA-R CCE are discharged through a dedicated stack. The RCE primarily encompasses Cells 1 and 2 of Pad 1, located inside the TSA-RE. The TSA-R CCE is located at the north end of TSA-RE on Pad R.

2.2 Proposed Modification

The permit application for the RCE/ICE was written to require the use of the ICE (a movable soft-sided tent-like enclosure with its own additional layer of HEPA ventilation) for treatment operations within the RCE. The ICE was also intended to provide additional containment when retrieving containers that pose a higher risk of release.

The process necessary for movement of the ICE unit within the RCE was found to be a significant obstacle for retrieval operations. Therefore, it was proposed that the RCE be reevaluated for the potential to perform treatment and without need of the ICE. However, the ICE will be retained as an optional means of providing 3-stage HEPA filtration when desired for operations within the RCE.

Additionally, retrieval and treatment operations will now be supported by the TSA-R CCE, a soft-sided contamination control enclosure and airlock, located on Pad R. The TSA-R CCE employs an independent 3 stage HEPA filtration system which discharges to the RCE stack.

The air quality modeling that was performed in support of the Application for the initial Permit to Construct (PTC) for the RCE/ICE employed AERSCREEN, an executable employing the screening mode of the AERMOD computer code, which produces dispersion coefficients with great conservatism. Releases associated with RCE operations without requiring the ICE, and the additional operations within the TSA-R

CCE, are expected to be higher. Therefore, it was necessary to perform a refined modeling analysis similar to that associated with the original PTC Application using the standard mode of AERMOD in order to maintain acceptable operating rates in accordance with project requirements.

2.3 AERMOD

The IDEQ currently accepts the use of AERMOD, which was promulgated in 2005 by the Environmental Protection Agency (EPA) in succession of the Industrial Source Complex 3 (ISC3) model. In contrast to ISC3, AERMOD has the capability to determine downwash effects for multiple buildings by calling the EPA "Building Profile Input Program" preprocessor computer code. The model was executed using the latest official binary of each computer code, as made available by the EPA on the Support Center for Regulatory Atmospheric Modeling (SCRAM) portion of the Technology Transfer Network (TTN) website, given that the computer codes are continually updated to reflect the best available science.

2.4 Significance and Full-Impact Analyses

A significance analysis was performed to evaluate the worst-case (high 1st high) impacts associated with the proposed changes to the source. For those pollutants which exceed the significance levels, a full-impact analysis was also performed. The full-impact analysis includes consideration of the total design emissions for the source as well as the background ambient concentration, in comparison with the National Ambient Air Quality Standards (NAAQS) limits. The full-impact analysis demonstrates NAAQS compliance, therefore establishing acceptability of the dispersion coefficients (24-hour and annual) used for determination of ambient concentrations of Toxic Air Pollutants (TAPs) listed in IDAPA 58.01.01.585 (for non-carcinogens) and 58.01.01.586 (for carcinogens) respectively.

Although the significance levels were not exceeded as demonstrated by the model, all values associated with the full-impact analysis are provided and evaluated for reference. Additionally, for those pollutants that were part of the significance analysis and which will not increase as a result of this proposed modification (e.g., SO_2), the full-impact analysis was performed and evaluated for reference. This additional evaluation serves to further demonstrate the acceptability of the proposed modification.

3.0 PROGRAM INPUT REQUIREMENTS

Requirements for model input are determined by regulatory agencies including the IDEQ and the EPA, but are also dictated by AERMOD computer code documentation. The requirements in detail can be obtained from both EPA and IDEQ documents listed in the references section of this methodology.

3.1 Regulatory Requirements

The IDEQ and the EPA require that inputs used for air pollution modeling represent the maximum impact that the source can be expected to impart through effluent release. Wherever a range of operating conditions were indicated for the RCE stack, an evaluation was performed to determine whether the high or low end of the range would result in greater ambient concentrations. When knowledge based evaluation could not be performed, preliminary models were executed using each option to determine the worst-case for the range of operating conditions.

3.1.1 Terrain Input Requirements

The EPA requires that an evaluation be performed to ensure that terrain data is provided in the terrain tiles and the model domain for terrain exceeding 10% slope away from any receptor in the network. The IDEQ requires the terrain files must be of sufficient resolution for the model (30 meters).

3.1.2 Downwash Input Requirements

For consideration in calculating the effects of downwash by nearby structures, the EPA has defined "nearby" structures as those located within 800 meters (1/2 mile) which are less than five times the distance away from the source than the height or length of the structure (whichever is less).

3.1.3 Ambient Air Determination

The determination of the ambient air distance must be made in accordance with the relevant portion of the *State of Idaho Air Quality Modeling Guideline.* It is assumed that air within the facility boundaries is ambient air unless the facility can demonstrate that public access is precluded. If the general public is prohibited by physical barriers, discouraged by type, size and location of area, controlled by posted signage or reasonable patrol of property then the boundary of these restrictions can be considered the ambient air boundary. If the previous limitations are not imposed on public access, then the ambient air boundary is at the distance clearly visible to facility employees with a regular outdoor presence.

3.2 Input Format

AERMOD allows for the input of variables in either imperial or metric units. For the modeling, metric units were used for the sake of simplicity (most available input data, including the digital elevation models, is provided using metric units). Source values obtained in imperial units were converted to metric units using industry accepted conversion factors.

3.2.1 Terrain Input Requirements

The AERMAP preprocessor requires that terrain height data be input in digital elevation model (DEM) or national elevation dataset (NED) file format. NED files are preferred as the DEM standard is antiquated and only NED files are maintained and regularly improved by the USGS.

Coordinate information using one of four principal data is permitted for use with AERMAP: WGS 72, WGS 84, NAD 27 and NAD 83. The AERMAP user guide states that of these four data (specifically for use with USGS NED files), all except for NAD 27 can be considered equivalent and do not benefit from conversion. However, conversion for NAD 27 must be considered when selecting AERMOD inputs for terrain information. AERMOD/AERMAP contains functionality for conversion from NAD 27 to NAD 83 (and effectively WGS 72 and WGS 84) using the included ".las" and ".los" files.

3.2.2 Downwash Input Requirements

The BPIP for Prime preprocessor requires the user to develop a text-based input listing containing the number of buildings, number of tiers for each building, the base elevation, height, and cartesian coordinates for all corner vertices. The listing must also include a reference to the stack, exercising care to identify the stack in the BPIP listing using the same name/description for the stack as is used in the AERMOD runstream image files. Coordinates may be provided using either relative cartesian coordinates or actual UTM coordinates. The datum of the UTM coordinates is of no consequence provided that all of the coordinates in the BPIP input listing relate to the same point of reference (e.g., absolute or relative).

3.2.3 Meteorological Input Requirements

AERMOD requires user input of surface and profile meteorological records for model execution. The IDEQ has provided the preferred meteorological data for models at the INL, precluding any need for preprocessing of surface, upper, or on-site meteorological data using the AERMET preprocessing application in support of this model. The AERMOD-ready data set includes surface data collected at an INL tower near Roberts supplemented by National Weather Service data collected at Idaho Falls Regional Airport (elevation 1,446 m) for the period from 2000 through 2004. Upper air data for the same period were collected at the Boise Airport.

4.0 ASSUMPTIONS

4.1 Source Type

The RCE stack is a vertical cylinder that employs drainage at its lowest point rather than a rain cap. A point source (non-horizontal, non-capped) was indicated using the location keyword for the source pathway.

4.2 Land Use Classification

A rural land use classification was determined for the source. This was determined in accordance with the method prescribed in the *EPA Guideline on Air Quality Models, Section 8.2.8.b.* According to the standard, a circle centered at the source with a radius of 3 km must contain less than 50% land zoned I1, I2, C1, R2 or R3 to allow the source to be considered rural. Otherwise the source must be modeled with the urban input parameter.

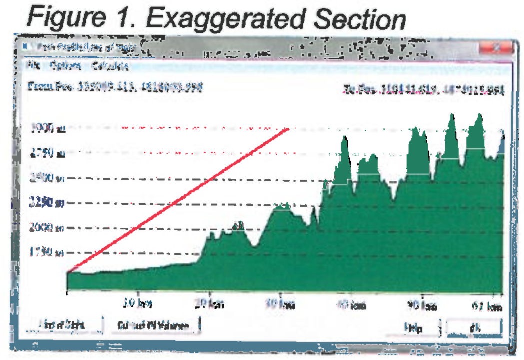
Land use classification can also be determined by using the population density for the area defined above. If the population exceeds 750 people per square kilometer, the model must use the urban input parameter. The former land use classification determination method is considered more definitive; however the source was determined to be rural according to both methods.

4.3 Terrain Heights

Topographical elevations were derived from NED (national elevation dataset) files made available by the United States Geological Survey (USGS). According to the metadata header for the NED files, the coordinate datum for the files is WGS 84 and the resolution is 1 arc-second. As discussed in section 3.2.1 of this document, no conversion was necessary. The NED files used (NED_62627803.tif, NED_62474571.tif) were obtained using The National Map (TNM) viewer, listed in the references section of this analysis.

Because significant terrain elevations include all terrain that is at or above a 10% slope from each and every receptor, a section was taken through the steepest area of the receptor network and compared to a linear representation of a 10% grade (see Figure 1). At any low receptor with high adjacent terrain, there was not an indication of an area exceeding 10% that was not available in the terrain data, based on apparent summit elevations. Additionally, initial modeling runs indicated that the maximum concentrations do not occur near the receptor network extents. Therefore, it is reasonable to assume that the maximum concentrations indicated, for the receptor networks defined, are the actual maximum impact for the source.

Figure 1. Exaggerated Section



4.4 Source and Building Locations

UTM coordinates for the source and buildings were taken from the INL Graphical Information System (GIS) database. The datum for this information is NAD 27. All BPIP inputs were converted to the WGS 84/NAD83 datum to eliminate the potential for errors. The converted stack location was then used for the AERMOD input listings so that it would be positioned correctly in relation to the terrain data for the AERMAP processing.

4.5 Emission Rate

0.126 g/s (1.0 lb/hr) was used to determine dispersion coefficient(s) in μ/m³ per lb/hr which could then be multiplied by the emission rate for each TAP (toxic air pollutant) to determine the respective ambient concentration.

4.6 Source Parameters

Stack parameters are contained in Table 1.

Table 1. Stack Specific Parameters

UTM Zone	12
UTM Easting (m)	335,083
UTM Northing (m)	4,818,103
Base Elevation (m)	1529.09 (AERMAP derived)
Stack height (m)	18.28
Temperature (K)	277.6
Stack Velocity (m/s)	6.5151
Diameter (m)	1.505

Table 2. Stack Operating Range

Parameter	Normal	Minimum	Maximum
Temperature (K)[a]	277.6 (min. used)	277.6	305.4
Stack Velocity (m/s)[b]	6.5151 (70% max.)	4.6552 (50% max.)	9.31164

a. Minimum temperature was used for conservatism. Lower temperatures result in higher ambient concentrations. A screening model was run for minimum and maximum case to verify this assumption.

b. The system is intended to operate at between 70% and 100% of the maximum capacity of the equipment. The model was run for both Normal and Maximum velocity to ensure that the value used is conservative.

4.7 Receptor Network

More than 33,000 receptor locations were modeled. A set of discrete receptors were provided and required by IDEQ for the INL boundary as well as all locations within the INL accessible to the public, such as the EBR-1 historic landmark and US Highways 20/22. These receptors were imported into the AERMAP runstream image. An additional receptor network is comprised of a cartesian network originating at the RCE stack location and extending 50 km in all directions (north, east, south and west). The spacing for the cartesian network is 500 meters in both axes, omitting those that would lie within the INL boundary.

Flagpole receptors were not considered appropriate for the RCE stack and thus were not selected for the AERMAP runstream image.

4.8 Meteorological and Surface Characteristics

The data files used were provided by IDEQ, for both the surface and profile meteorological records. The upper air record provided is for the Boise, Idaho area. The primary location of surface meteorological data is identified by filenames: "IDF-Roberts". This data was provided for five one-year periods provided by IDEQ. Also included is a concatenated five-year record. For all of the high values returned, the greater value is accepted between the runs when individual years are processed (as was the case for NO_X and SO_2 annual averaging).

4.9 Downwash Considerations

Building Profile Input Program for PRIME was used prior modeling to calculate the appropriate building dimension data for use in the AERMOD runstream images to account for building downwash effects. The building(s) for which downwash needed to be considered were determined using the EPA definition of "nearby" buildings. The only building identified as nearby was the TSA-RE.

5.0 ANALYSIS

Air quality criteria apply to all "ambient air" locations that could be impacted by a source. IDAPA 58.01.01 defines "ambient air" as "that portion of the atmosphere, external to buildings, to which the general public has access." At the INL, this has been interpreted to include all locations beyond the INL boundary (off-site), the three public highways that traverse the INL (US 20/26, SH 33, SH 22) which constitute a public right-of-way, the EBR-1 Historic Landmark which is accessible to the general public from Memorial Day to Labor Day, as well as any other parcels within the INL boundary which are privately owned or publicly accessible.

To obtain the correct high values for annual SO_2 and NO_2, it was necessary to execute the model separately for each year of meteorological data. From this, the highest between all five unique first high values between all years will be used. The model was also executed using a concatenated five-year set of meteorological data, to determine appropriate high values for short term SO_2 and NO_2 averaging as well as all other pollutants.

The dispersion coefficient for carcinogenic TAPs was determined using highest value for the maximum annual averaging period concentration. The dispersion coefficient for non-carcinogenic TAPs was determined using the highest 24-hour averaging period concentration. Lead emissions were modeled using the LEADPOST post-processing application.

5.1 Modeling Threshold Analysis

IDEQ typically does not require modeling when changes in estimated criteria pollutant emission rates for a proposed project are below the DEQ modeling thresholds. Threshold I levels were used to evaluate the emissions increase for this project in Table 3 below. The modification includes the addition of one forklift to fuel burning equipment emissions, which are included in the modeling threshold analysis.

As demonstrated in the Table 3, four of the DEQ Modeling Thresholds were exceeded: NO_2 (1-hour); SO_2 (1-hour, 24-hour, and annual). Also, the modification does pose an increase in abated emissions which would produce TAP concentrations in excess of the limits stated in IDAPA 48.01.01.585 and IDAPA 58.01.01.586. Therefore, modeling was performed for all pollutants and averaging periods in order to determine dispersion coefficients with reduced conservatism which would result in acceptable ambient air concentrations.

Table 3. DEQ Modeling Thresholds for Criteria Pollutants

Pollutant	Averaging Period	Threshold I [a]	Current Emissions [b,e]	Proposed Emissions [c,e]	Emissions Increase	Threshold Exceeded
PM_{10}	24 hour	0.22 lb/hr	7.09E-03 *lb/hr*	1.87E-02 *lb/hr*	1.16E-02 *lb/hr*	No
$PM_{2.5}$	24 hour	0.054 lb/hr	7.09E-03 *lb/hr*	1.87E-02 *lb/hr*	1.16E-02 *lb/hr*	No
$PM_{2.5}$	annual	0.35 T/y	3.11E-02 *T/y*	8.19E-02 *T/y*	5.08E-02 *T/yr*	No
CO	1 hour, 8 hour	15 lb/hr	1.38E+00 *lb/hr*	1.51E+00 *lb/hr*	1.30E-01 *lb/hr*	No
NO_2	1 hour	0.20 lb/hr	7.79E+00 *lb/hr*	9.69E+00 *lb/hr*	1.90E+00 *lb/hr*	Yes
NO_2	annual	1.2 T/y	6.04E+00 *T/y*	6.62E+00 *T/y*	5.80E-01 *T/y*	No
SO_2	1 hour	0.21 lb/hr	1.12E+00 *lb/hr*	1.40E+00 *lb/hr*	2.80E-01 *lb/hr*	Yes
SO_2	24 hour	0.22 lb/hr	1.12E+00 *lb/hr*	1.40E+00 *lb/hr*	2.80E-01 *lb/hr*	Yes
SO_2	annual	1.2 T/y	4.91E+00 *T/y*	6.13E+00 *T/y*	1.22E+00 *T/y*	Yes
Lead	3-month rolling average	14 lb/mo	1.32E+00 *lb/mo*	3.48E+00 *lb/mo*	2.16E+00 *lb/mp*	No

a. Thresholds are listed in Table 2 of the *State of Idaho Air Quality Modeling Guideline*.

b. Current emissions are sum of all emissions sources listed in Table 4-12 of the Permit To Construct application submitted to the DEQ on April 20, 2011.

c. Proposed emissions are sum of all emissions sources listed in Table 4-12 of the Permit To Construct application associated with the proposed modifications.

5.2 Significant Impact Analysis

The increase in emission of pollutants CO, NO_2, and SO_2 are attributed to fuel burning equipment, the use of which is not required for inclusion in a significant impact analysis. However, the impacts of these pollutants were evaluated for reference purposes only.

The significant impact analysis determined the high first high (h1h) or first high (1h) values for short-term and annual averaging periods, respectively. These values, representing dispersion coefficients, were multiplied by the increase of each pollutant for which there exists a Significant Contribution Level (SCL). The resulting products, representing the maximum ambient concentrations associated with the emissions increase, were compared with the SCLs to determine whether a full impact analysis is necessary.

As shown in Table 4, the only pollutant for which the SCL was exceeded is NO_2 (1-hour). As this pollutant is only evaluated in the analysis for reference purposes (the emissions increase is a result of additional mobile fuel burning equipment), a full impact analysis is not required for the proposed modification.

Table 4. Significant Impact Analysis

Pollutant	Averaging Period	Emissions Increase (lbs/hr)[a]	Dispersion Coefficient [(μg/m3)/(lb/hr)][b]	Ambient Air Concentration (μg/m3)[c]	Significant Contribution Level (SCL) [d]	SCL Exceeded
PM_{10}	24 hour	1.16E-02	0.85747	9.96E-03	5	No
PM_{10}	annual	1.16E-02	0.04854	5.64E-04	1	No
$PM_{2.5}$	24 hour	1.16E-02	0.57082	6.63E-03	1.2	No
$PM_{2.5}$	annual	5.08E-02	0.04854	2.47E-03	0.3	No
CO	1 hour	1.30E-01	17.79989	2.31E+00	2000	No
CO	8 hour	1.30E-01	2.30348	2.99E-01	500	No
NO_2	1 hour	1.90E+00	17.79989	3.38E+01	7.5	Yes
NO_2	annual	5.80E-01	0.05407	3.14E-02	1	No
SO_2	1 hour	2.80E-01	17.79989	4.98E+00	7.8	No
SO_2	24 hour	2.80E-01	0.85747	2.40E-01	5	No
SO_2	annual	1.22E+00	0.05407	6.60E-02	1	No

a. Emissions increase calculated in pounds per hour (lb/hr) by taking difference in total emissions for each criteria pollutant between the proposed modification and the approved permit application. (See Table 4-12 in the Permit To Construct application for the proposed modifications)

b. The dispersion coefficients returned by AERMOD for the significant impact analysis are provided in Table 6.

c. Ambient air concentrations (AAC) are the product of the emissions increase and the dispersion coefficient for each pollutant in question.

d. Significant Contribution Levels are found in IDAPA 58.01.01.107.

5.3 Full Impact Analysis

A full impact analysis was not required for the proposed modification based on the results of the significant impact analysis. However, the full impacts for all pollutants were evaluated regardless of whether required by the significant impact analysis. It should be noted that the evaluation of full impact in this case is provided for reference only.

The full impact analysis determined the h1h and 1h values as was done in the significant impact analysis, but with several exceptions. The high sixth high (h6h) value was identified for 24-hour PM_{10}, the high second high (h2h) value for 1-hour CO, the high fourth high (h4h) value for 1-hour SO_2, and the high eighth high (h8h) value for 1-hour NO_2.

5.4 Computer Configuration

Computer hardware suitability was evaluated using the test-case models provided with the AERMOD executable to ensure acceptable behavior. Table 5 provides information on the software versions that were used in the execution of the model.

Table 5. Software Versions

Computer Code	Binary Version
AERMOD	12060
AERMAP	11103
BPIP for Prime	04274
LEADPOST	12114

5.5 Results

Tables 6 and 7 contain the resulting dispersion coefficients for the final AERMOD model run performed using the inputs and assumptions discussed within this document.

Table 6. Significant Impact Analysis Values

Applicable Pollutants	Averaging Period	Rank	Dispersion Coefficient [(µg/m3)/(lb/hr)]	Easting (UTM)	Northing (UTM)	Elevation (meters)
PM-2.5	ANNUAL	1H	0.04854	336497	4812706	1549.61
SO2, PM-10	24	H1H	0.85747	337500	4812500	1549.86
CO	8	H1H	2.30348	335500	4812500	1548.05
SO2	3	H1H	5.95845	335500	4812500	1548.05
CO, SO2,NO2/NOX	1	H1H	17.79989	335500	4812500	1548.05
PM-2.5	24	1H	0.57082	337000	4812000	1546.43
SO2, NO2/NOX	ANNUAL	1H	0.05407	336497	4812706	1549.61

Table 7. Full Impact Analysis Values

Applicable Pollutants	Averaging Period	Rank	Dispersion Coefficient [(µg/m3)/(lb/hr)]	Easting (UTM)	Northing (UTM)	Elevation (meters)
Carcinogenic TAPs, PM-2.5	ANNUAL	1H	0.04854	336497	4812706	1549.61
Pb (leadpost, rolling 3-mo. ave.)	MONTH	H1H	0.0953567	336898	4812697	1549.06
Non-Carcinogenic TAPs, SO2	24	H1H	0.85747	337500	4812500	1549.86
PM-10	24	H6H	0.51924	335500	4812500	1548.05
CO	8	H1H	2.30348	335500	4812500	1548.05
SO2	3	H1H	5.95845	335500	4812500	1548.05
VOCs	1	H1H	17.79989	335500	4812500	1548.05
CO	1	H2H	14.31434	337500	4812500	1549.86
SO2	1	H4H	11.63921	337000	4812000	1546.43
PM-2.5	24	1H	0.57082	337000	4812000	1546.43
NO2/NOX	1	H8H	8.48173	335500	4812500	1548.05
SO2, NO2/NOX	ANNUAL	1H	0.05407	336497	4812706	1549.61

6.0 REFERENCES

1. EPA, 40 CFR 51, Appendix W, *Guideline on Air Quality Models,* 1996.

2. Idaho DEQ, Rules for the Control of Air Pollution in Idaho (IDAPA 58.01.01), 2012.

3. Staley, C. S. & Abbott, M. L., *INEEL Air Modeling Protocol,* LMITCO Integrated Earth Sciences, INEEL/INT-98-00236, May 1998.

4. Idaho DEQ, 2011, *State of Idaho Air Quality Modeling Guideline,* Idaho Department of Environmental Quality, Air Quality Division, Stationary Source Program, ID AQ-011, 07/02/11.

5. EPA, EPA-454/B-03-001, Users Guide for the AMS/EPA Regulatory Model (AERMOD), September, 2004.

6. EPA, EPA-454/B-03-001, Users Guide for the AMS/EPA Regulatory Model (AERMOD) Addendum, February 2012.

7. EPA, EPA-454/B-03-003, User's Guide for the AERMOD Terrain Preprocessor (AERMAP), October, 2004.

8. EPA, EPA-454/B-03-003, User's Guide for the AERMOD Terrain Preprocessor (AERMAP) Addendum, March, 2011.

9. EPA, EPA-454/R-93-038, User's Guide to the Building Profile Input Program, February 8, 1995.

10. EPA, EPA-454/R-93-038, User's Guide to the Building Profile Input Program, Addendum, April 21, 2004.

11. IDEQ P.2011.0109 (Permit to Construct), Transuranic Storage Area – Retrieval Enclosure, Idaho National Laboratory, Facility ID No. 023-00001, Issued September 19, 2011

12. US Geological Survey "The National Map Viewer". A website providing 1-arc-minute National Elevation Dataset (NED) files. Last accessed on August 8, 2012. http://viewer.nationalmap.gov/viewer/

Attachment 1 – AERMOD Listing Files

(Included in the electronic copy)

APPENDIX F. DEQ CORRESPONDENCE

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 NORTH HILTON, BOISE, ID 83706 · (208) 373-0502

C. L. "BUTCH" OTTER, GOVERNOR
CURT FRANSEN, DIRECTOR

December 17, 2012

VIA EMAIL

Mr. Mark J. Wescoat, Director
AMWTP Environmental, Safety & Health
Idaho Treatment Group, LLC
850 Energy Drive, Suite 100
Idaho Falls, ID 83401

RE: Facility ID No. 023-00001, U.S. Department of Energy, Idaho Operations Office, Idaho Falls RWMC, Storage Area Retrieval Enclosure (TSA-RE)
Modeling Protocol Approval for TSA-RE, Retrieval Contamination Enclosure (RCE), PTC Modification – MJW-06-12

Dear Mr. Wescoat:

On October 11, 2012, the Department of Environmental Quality (DEQ) received a dispersion modeling protocol/preliminary analyses for this project by email from Vicki Hooper of the Idaho Treatment Group, LLC (ITG). The modeling protocol proposes methods for use in the ambient impact analyses to support removing an existing permit provision requiring the use of the Inner Contamination Enclosure (ICE), which is located within the RCE.

The modeling protocol has been reviewed and DEQ has the following comments:

Comment 1. DEQ provided AERMOD-ready meteorological data to ITG's Christian Maupin on June 12, 2012. This AERMOD-ready data set includes surface data collected at an INL tower located near Roberts supplemented by National Weather Service data collected at the Idaho Falls Regional airport (elevation 1,446 m) for the period from 2000 through 2004. Upper air data for the same period were collected at the Boise Airport.

Comment 2. The approach described for addressing building downwash appears reasonable. DEQ concurs with the description of the ambient air boundary for INL facilities as described in the protocol. *Please ensure that the plot plan submitted with the application shows all buildings located within a 5L distance of the source.*

Comment 3. The proposal to determine elevations and hill heights using NED data with a maximum resolution of 1 arc-second (~30 meters) is acceptable, due to the relatively flat terrain near the facility.

Comment 4. Please note that noncarcinogenic TAPs are subject to a 24-hour standard, and carcinogenic TAPs are subject to an annual standard. The labels in Table 5 of the protocol have these reversed. Note that only the <u>increase</u> in emissions of any TAP that was evaluated for the previous permit should be evaluated against the applicable screening emission level (EL) to determine whether modeling for that TAP is needed, and to determine whether the ambient impacts of just the increase in emissions of that TAP is less than the acceptable increment. Modeling for carcinogenic and noncarcinogenic TAPs may use a concatenated 5-year meteorological data set rather than running each year separately.

Comment 5. The application should provide documentation and justification for all stack parameters used in the modeling analyses, clearly showing how gas temperatures and flow rates were estimated. Include calculations and assumptions. In most instances, applicants should use typical parameters, not maximum temperatures and flow rates. Please include vendor documentation if vendor information is used as a basis for exhaust parameters.

Comment 6. Modeling is typically not required if the changes in estimated criteria pollutant emission rates for a proposed project are below DEQ's modeling thresholds, shown in Table 1. Based on the exhaust characteristics of the stack at the TSA-RE, Threshold I levels should be used for this project. "Case-by-case" thresholds may be used only with prior DEQ approval.

Table 2. DEQ CRITERIA POLLUTANT MODELING THRESHOLDS

Criteria Air Pollutants	Averaging Period	DEQ Modeling Threshold			
		Threshold I		Threshold II (Case-by-Case)	
PM_{10}	24-hr	0.22	lb/hr	2.6	lb/hr
$PM_{2.5}$	24-hr	0.054	lb/hr	0.63	lb/hr
	Annual	0.35	T/yr	4.1	T/yr
CO	1-hr, 8-hr	15	lb/hr	175	lb/hr
NO_2	1-hour	0.20	lb/hr	2.4	lb/hr
	Annual	1.2	T/yr	14	T/yr
SO_2	1-hr	0.21	lb/hr	2.5	lb/hr
	24-hr	0.22	lb/hr	2.6	lb/hr
	Annual	1.2	T/yr	14	T/yr
Lead	3-month rolling avg	14	lb/mo		

DEQ's modeling staff considers the submitted dispersion modeling protocol, with resolution of the additional items noted above, to be approved. It should be noted, however, that the approval of this modeling protocol is not meant to imply approval of a completed dispersion modeling analysis. Please refer to the State of Idaho Air Quality Modeling Guideline, which is available on the Internet at http://www.deq.state.id.us/air/permits_forms/permitting/modeling_guideline.pdf, for further guidance.

To ensure a complete and timely review of the final analysis, our modeling staff requests an analysis report be submitted along with electronic copies of all modeling input and output files, including BPIP, AERMAP, and AERMOD input and output files. If you have any further questions or comments, please contact me at (208) 373-0220 or cheryl.robinson@deq.idaho.gov.

Sincerely,

Cheryl A. Robinson

Cheryl A. Robinson, P.E.
NSR Modeling Analyst, Air Quality Division

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