ICDF Complex Five-Year Operations and Maintenance Activities Report for Fiscal Years 2010 through 2014

Karen N. Koslow

March 2015
ICDF Complex Operations and Maintenance Activities Five-Year Report for Fiscal Years 2010 through 2014

Karen N. Koslow

March 2015

Idaho Cleanup Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14516
ABSTRACT

The Idaho Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Disposal Facility (ICDF) was authorized in the Operable Unit 3-13 Record of Decision (DOE/ID-10660) for disposal of waste from Idaho National Laboratory (INL) Site CERCLA environmental restoration activities. The ICDF Complex is designed to serve as a centralized, engineered disposal facility for INL Site CERCLA wastes that meet the ICDF Waste Acceptance Criteria (DOE/ID-10881). Waste is permanently disposed of in the ICDF Landfill.

The ICDF Complex Operations and Maintenance Plan (DOE/ID-11000) presents the operational approach and requirements for operating the systems and components of the ICDF Complex. The Operations and Maintenance Plan ensures compliance with regulatory requirements that are in place to provide for the protection of human health and the environment. This report summarizes the activities and monitoring over the last 5 years, which include Fiscal Years 2010 through 2014, that support the determination that the ICDF Complex remedy is protective of human health and the environment and is functioning as intended during the operational phase.
## CONTENTS

ABSTRACT ................................................................................................................................................. iii  
ACRONYMS .............................................................................................................................................. vii  
1. INTRODUCTION .............................................................................................................................. 1  
2. WASTE ACCEPTANCE CRITERIA ............................................................................................... 1  
3. LANDFILL WASTE RECEIPTS ................................................................................................. 4  
4. VISUAL ROUTINE MAINTENANCE INSPECTIONS ................................................................ 9  
5. RADIOACTIVE WASTE MANAGEMENT .................................................................................... 9  
6. LEACHATE ANALYSIS ................................................................................................................ 10  
7. EVAPORATION POND SAMPLING OF LIQUID AND SEDIMENTS ....................................... 11  
8. ICDF EVAPORATION POND WATER BALANCE ..................................................................... 11  
10. GROUNDWATER MONITORING ............................................................................................. 14  
11. NESHAP COMPLIANCE REPORTING .................................................................................... 16  
12. SUMMARY ..................................................................................................................................... 16  
13. REFERENCES ................................................................................................................................. 17  

## FIGURES

1. Location of the Idaho CERCLA Disposal Facility on the Idaho National Laboratory Site .......... 2  
2. View of Idaho CERCLA Disposal Facility Landfill and Evaporation Ponds oriented to the north (photo taken October 2014) ................................................................. 3  
3. Disposal of soil sacks from AMWTP to the ICDF Landfill during FY 2014 .............................. 6  
4. Disposal of grouted empty AMWTP Phase 1 cargo containers to the ICDF Landfill during FY 2014 ................................................................. 6  
5. Placement of INTEC drained electrical transformer in FY 2013 ............................................. 7  
6. Disposal and solidification of D&D waste from the Materials and Fuels Complex treated at the ICDF Landfill in FY 2012 ................................................................. 7  
7. Materials and Fuels Complex alcohol tanks disposed of to the ICDF Landfill in FY 2011 ....... 8  
8. Materials and Test Reactor vessel disposal to the ICDF Landfill in FY 2011 ........................... 8  
9. NuPac cask liner disposal in FY 2010 ....................................................................................... 9  
10. Measured, calculated, and projected depths in the east evaporation pond ......................... 12  
11. Measured, calculated, and projected depths in the west evaporation pond ......................... 12  
12. Measured, calculated, and projected depths for the sum of the east and west evaporation ponds ... 13  
13. Idaho CERCLA Disposal Facility layout, well locations, and former percolation ponds ......... 15
<table>
<thead>
<tr>
<th>TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Net volume of waste disposed of at the ICDF Landfill, the remaining capacity, and percent filled.</td>
</tr>
</tbody>
</table>

---

vi
## ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMWTP</td>
<td>Advanced Mixed Waste Treatment Project</td>
</tr>
<tr>
<td>CA</td>
<td>composite analysis</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>CY</td>
<td>calendar year</td>
</tr>
<tr>
<td>D&amp;D</td>
<td>decommissioning and demolition</td>
</tr>
<tr>
<td>DAS</td>
<td>Disposal Authorization Statement</td>
</tr>
<tr>
<td>FY</td>
<td>fiscal year</td>
</tr>
<tr>
<td>ICDF</td>
<td>Idaho CERCLA Disposal Facility</td>
</tr>
<tr>
<td>INL</td>
<td>Idaho National Laboratory</td>
</tr>
<tr>
<td>INTEC</td>
<td>Idaho Nuclear Technology and Engineering Center</td>
</tr>
<tr>
<td>IWTS</td>
<td>Integrated Waste Tracking System</td>
</tr>
<tr>
<td>LCRS</td>
<td>leachate collection and recovery system</td>
</tr>
<tr>
<td>LFRG</td>
<td>Low-Level Waste Disposal Facility Federal Review Group</td>
</tr>
<tr>
<td>NESHAP</td>
<td>National Emission Standards for Hazardous Air Pollutants</td>
</tr>
<tr>
<td>OU</td>
<td>operable unit</td>
</tr>
<tr>
<td>PA</td>
<td>performance assessment</td>
</tr>
<tr>
<td>PLDRS</td>
<td>primary leak detection recovery system</td>
</tr>
<tr>
<td>SLDRS</td>
<td>secondary leak detection recovery system</td>
</tr>
<tr>
<td>WAC</td>
<td>Waste Acceptance Criteria</td>
</tr>
</tbody>
</table>
ICDF Complex Operations and Maintenance Five-Year Report for Fiscal Years 2010 through 2014

1. INTRODUCTION

The Idaho Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Disposal Facility (ICDF) was authorized in the Operable Unit (OU) 3-13 Record of Decision (DOE-ID 1999) for disposal of waste from Idaho National Laboratory (INL) Site CERCLA environmental restoration activities. The ICDF has been operating since 2003 in compliance with CERCLA requirements and Waste Acceptance Criteria (WAC) developed in the CERCLA process and in accordance with DOE O 435.1 Chg 1, “Radioactive Waste Management,” requirements.

The ICDF is a state-of-the-art engineered disposal facility located south of the Idaho Nuclear Technology and Engineering Center (INTEC) in the south-central portion of the INL Site (see Figure 1). The major components of the ICDF Complex include the following: disposal cells (landfill), two evaporation ponds (east and west), administration trailer, scale, decontamination building (with treatment area) (not in use during report period Fiscal Years [FYS] 2010 through 2014), contaminated equipment pad (not in use during report period FYs 2010 through 2014), and staging and storage areas.

Together, the above components of the ICDF provide centralized waste acceptance; inspection; treatment, if necessary; and disposal of CERCLA-generated waste types resulting from remediation and decommissioning and demolition (D&D) sites at the INL Site.

Figure 2 is a photo of the landfill taken during an October 2014 flyover. The ICDF Landfill includes layers of liners constructed of both synthetic and geologic materials and is fully compliant with the Resource Conservation and Recovery Act (42 USC 6901 et seq.) Subpart C. The landfill design disposal capacity is roughly 389,293 m$^3$ (510,000 yd$^3$). It began receiving waste on September 16, 2003.

ICDF Complex Waste Acceptance Criteria specifies the chemical and radiological WAC for waste disposal at ICDF (DOE-ID 2013a). The purpose of this document is to provide criteria, including quantities, of radioactive and/or hazardous constituents allowable in waste streams designated for disposal at ICDF. The WAC is divided into four sections: (1) General ICDF Complex; (2) Landfill; (3) Evaporation Pond; and (4) Staging, Storage, Sizing, and Treatment Facility.

This report summarizes the activities and monitoring over the last 5 years including FYs 2010 through 2014 that support the determination that, during the operational phase, the ICDF Complex remedy is protective of human health and the environment.

2. WASTE ACCEPTANCE CRITERIA

ICDF Complex Waste Acceptance Criteria specifies the chemical and radiological WAC for waste disposal at ICDF (DOE-ID 2013a). The purpose of this document is to provide criteria, including quantities, of radioactive and/or hazardous constituents allowable in waste streams designated for disposal at ICDF. The WAC is divided into four sections: (1) General ICDF Complex; (2) Landfill; (3) Evaporation Pond; and (4) Staging, Storage, Sizing, and Treatment Facility.

Compliance with the requirements of this document ensures protection of human health and the environment, including the Snake River Plain Aquifer. Waste placed in the ICDF Landfill and Evaporation Pond must not cause groundwater in the Snake River Plain Aquifer to exceed maximum contaminant levels, a hazard index of 1, or $10^{-4}$ cumulative risk levels. The defined WAC concentrations were compared to the design inventory concentrations to show an acceptable uncertainty margin exists based on the actual constituent concentrations anticipated for disposal at ICDF. Implementation of this WAC document will ensure compliance with the Final Record of Decision for the Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13 (DOE-ID 1999). For waste to be received, it must meet the WAC for the specific disposal/treatment unit for which it is destined.
Figure 1. Location of the Idaho CERCLA Disposal Facility on the Idaho National Laboratory Site.
Figure 2. View of Idaho CERCLA Disposal Facility Landfill and Evaporation Ponds oriented to the north (photo taken October 2014).
The ICDF WAC was revised in 2013 to include editorial updates. This revision of the WAC specified that “returned aqueous waste from on-or off-Site INL laboratories from well sampling activities is accepted at the ICDF.” Revisions to the WAC in 2012 included a process to add chemical or radioactive constituents to the WAC when they were not previously called out in Table A-1. Revisions to the WAC in 2011 included updates for consistency with the most recent ICDF Performance Assessment (PA) (DOE-ID 2011). Revisions to the WAC in 2010 included updates to Table A-1 adding footnotes for half-life data and WAC limits for Ca-41, Ba-133, 1,1-biphenyl, Cl-36, Mo-93, and Re-187.

3. **LANDFILL WASTE RECEIPTS**

The Integrated Waste Tracking System (IWTS) database provides the actual waste disposal information for the ICDF Landfill. This section includes the waste volumes disposed of to the landfill, the radionuclide waste inventory disposed of to the landfill, and waste forms disposed of to the landfill.

The net volume of waste disposed of at the ICDF Landfill from its start in September 2003 through FY 2014 was 286,717 m$^3$ (375,025 yd$^3$) (Table 1). After 11 years of operation, 69% of the available volume of the ICDF Landfill has been filled (EDF-10709). At the start of FY 2015, an approximate volume of 122,936 m$^3$ (160,800 yd$^3$) remains of the total landfill capacity (EDF-10709). A total of 2,960 m$^3$ (3,872 yd$^3$) of waste was disposed of at the ICDF Landfill in FY 2014 compared to 13 m$^3$ (17 yd$^3$) in FY 2013, 2,577 (3,370 yd$^3$) in FY 2012, 24,490 m$^3$ (32,033 yd$^3$) in FY 2011, and 17,046 m$^3$ (22,300 yd$^3$) in FY 2010. Projected volumes of waste disposal through FY 2015 are consistent with the Idaho Cleanup Project-II contract (DOE-ID 2012a); whereas, projected volumes of waste disposal for FY 2016 through FY 2018 depend on future contract scope and funding.

Waste forms at the ICDF Landfill include solid debris, activated metals, graphite, soils, personal protective equipment, concrete, asphalt, glass, steel, wood, metals, plastic, grout, piping, filters, etc. Waste containers for packaged waste disposals include metal drums, metal boxes, wood boxes, concrete boxes, and cloth soil sacks. The bulk waste, mainly soils and debris (pipe, structural steel, building rubble, etc.), is hauled to the landfill in dump trucks and roll-offs. The waste disposed of in FY 2014 consisted of 105 empty cargo containers from the Advanced Mixed Waste Treatment Project (AMWTP) that were grouted for final disposal and 41 soil sacks also from AMWTP (see Figures 3 and 4). The waste disposed of in FY 2013 consisted of two containers, one containing weeds and vegetation and the other a nonstandard waste disposal containing a drained electrical transformer (Figure 5). The majority of the waste disposed of in FY 2012 consisted of soil and debris. Nonstandard waste disposals in FY 2012 included the solidified treatment solution generated from D&D of the Experimental Breeder Reactor II reactor (Figure 6). Nonstandard waste disposals in FY 2011 included the Materials Test Reactor vessel, TRA-632 Hot Cell #1 monolith, and the white elephant transport cask containing a canister of “unprocessable” Co-60 from the TRA-632 Hot Cell #3 (see Figures 7 and 8). Nonstandard waste disposals in FY 2010 included the NuPac cask liner (Figure 9). Much of the debris disposed of from D&D activities was grouted in place to minimize subsidence.
<table>
<thead>
<tr>
<th>End of FY</th>
<th>Net Volume Disposed(^a) (m(^3))</th>
<th>Net Volume Disposed(^a) (yd(^3))</th>
<th>Remaining Capacity (m(^3))</th>
<th>Remaining Capacity (yd(^3))</th>
<th>Percent Filled(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>3,181</td>
<td>4,161</td>
<td>382,268</td>
<td>500,007</td>
<td>2</td>
</tr>
<tr>
<td>2004</td>
<td>73,363</td>
<td>95,959</td>
<td>302,560</td>
<td>395,748</td>
<td>22</td>
</tr>
<tr>
<td>2005</td>
<td>58,508</td>
<td>76,528</td>
<td>257,635</td>
<td>336,987</td>
<td>34</td>
</tr>
<tr>
<td>2006</td>
<td>20,387</td>
<td>26,666</td>
<td>236,067</td>
<td>308,776</td>
<td>39</td>
</tr>
<tr>
<td>2007</td>
<td>27,613</td>
<td>36,118</td>
<td>207,757</td>
<td>271,746</td>
<td>47</td>
</tr>
<tr>
<td>2008</td>
<td>35,270</td>
<td>46,133</td>
<td>187,458(^c)</td>
<td>245,195(^c)</td>
<td>52</td>
</tr>
<tr>
<td>2009</td>
<td>21,309</td>
<td>27,872</td>
<td>171,744(^d)</td>
<td>224,641(^d)</td>
<td>56</td>
</tr>
<tr>
<td>2010</td>
<td>17,046</td>
<td>22,297</td>
<td>156,662(^e)</td>
<td>204,914(^e)</td>
<td>60</td>
</tr>
<tr>
<td>2011</td>
<td>24,490</td>
<td>32,033</td>
<td>145,166(^f)</td>
<td>189,877(^f)</td>
<td>63</td>
</tr>
<tr>
<td>2012</td>
<td>2,577</td>
<td>3,370</td>
<td>138,705(^g)</td>
<td>181,426(^g)</td>
<td>64</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
<td>17</td>
<td>138,692(^h)</td>
<td>181,409(^h)</td>
<td>64</td>
</tr>
<tr>
<td>2014</td>
<td>2,960</td>
<td>3,872</td>
<td>122,936(^i)</td>
<td>160,800(^i)</td>
<td>69</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>286,717</strong></td>
<td><strong>375,025</strong></td>
<td><strong>NA</strong></td>
<td><strong>NA</strong></td>
<td><strong>NA</strong></td>
</tr>
</tbody>
</table>

a. From IWTS.
b. Percent filled is based on the landfill design capacity of 389,293 m\(^3\) (510,000 yd\(^3\)).
c. From 2008 aerial survey (EDF-9071).
d. From 2009 aerial survey (EDF-9515).
e. From 2010 aerial survey (EDF-9997).
f. From 2011 aerial survey (EDF-10238).
g. From 2012 aerial survey (EDF-10444).
h. From 2012 aerial survey (EDF-10444) minus the net volume disposed of in 2013.
i. From 2014 aerial survey (EDF-10709).

FY  = fiscal year
IWTS = Integrated Waste Tracking System
NA  = not applicable
Figure 3. Disposal of soil sacks from AMWTP to the ICDF Landfill during FY 2014.

Figure 4. Disposal of grouted empty AMWTP Phase 1 cargo containers to the ICDF Landfill during FY 2014.
Figure 5. Placement of INTEC drained electrical transformer in FY 2013.

Figure 6. Disposal and solidification of D&D waste from the Materials and Fuels Complex treated at the ICDF Landfill in FY 2012.
Figure 7. Materials and Fuels Complex alcohol tanks disposed of to the ICDF Landfill in FY 2011.

Figure 8. Materials and Test Reactor vessel disposal to the ICDF Landfill in FY 2011.
4. VISUAL ROUTINE MAINTENANCE INSPECTIONS

The ICDF Complex Operations and Maintenance Plan (DOE-ID 2013b) specifies several visual inspections be made of the landfill and supporting structures. The visual inspections include: (1) the condition of access controls (i.e. signs, postings, markers, and fences), (2) the exposed evaporation high-density polyethylene liner material to ensure its integrity, (3) any reseeded or reclaimed areas to determine viability (not currently applicable), and (4) run-on and run-off controls to ensure adequacy of drainage controls.

Visual inspections to date have not indicated any noteworthy deficiencies in the landfill and supporting structures.

5. RADIOACTIVE WASTE MANAGEMENT

In developing the OU 3-13 Record of Decision (DOE-ID 1999), DOE O 435.1 Chg 1, “Radioactive Waste Management,” was identified as a “to be considered” requirement for the ICDF. To demonstrate that the disposal facility is protective of human health and the environment—a requirement under DOE O 435.1 Chg 1 that must be met to obtain the Disposal Authorization Statement (DAS) for facility operations—both a PA and a composite analysis (CA) were prepared (DOE-ID 2003a, DOE-ID 2003b, respectively). In addition, to demonstrate that ICDF will be in compliance with DOE O 435.1 Chg 1 during operations, a compliance demonstration document was submitted (DOE-ID 2003c). This document cross-walked the process conducted under CERCLA for the ICDF Landfill to the requirements under DOE O 435.1 Chg 1. The Low-Level Waste Disposal Facility Federal Review Group (LFRG) reviewed the information submitted, found that the documentation submitted demonstrates compliance with DOE O 435.1 Chg 1, and recommended that disposal authorization be granted for the ICDF Landfill (Frei 2003).
Since that time, an annual summary and determination (beginning with Koslow and Rood 2009) indicated the inventory assessed in the PA (DOE-ID 2003a) was less than the actual and projected disposals for many of the radionuclides. Some of the more recent waste forms disposed of were different from the waste form of compacted soil assessed in the 2003 PA. Koslow and Rood (2009) recommended that a technical update to the PA (DOE-ID 2003a) be performed to reflect an upper-bound projected inventory using the new source release and vadose zone transport model (mixing cell model) (Rood 2005). The LFRG (LFRG 2010) reviewed the updated PA (DOE-ID 2011) and no key issues were identified. A revision to the DAS was issued in April 2011 (Marcinowski 2011).

DOE M 435.1-1 Chg 2, “Radioactive Waste Management Manual,” IV.P.(4)(c), stipulates that annual summaries of low-level waste disposal operations shall be prepared with respect to conclusions and recommendations of the PA and CA. The annual review evaluates the adequacy of the approved PA (DOE-ID 2011) and CA (DOE-ID 2003b) and verifies that the low-level waste operations were conducted within the bounds of the PA/CA and U.S. Department of Energy DAS (Marcinowski 2011). The annual reviews for FY 2010 through FY 2014 all confirm existing controls continue to be effective and indicate the conclusions of the PA and CA did not change and the results remain valid (Koslow 2011, 2012, 2013, 2014, and 2015a).

6. LEACHATE ANALYSIS

The ICDF Landfill is a state-of-the-art engineered disposal facility that includes layers of liners constructed of both synthetic and geologic materials and is fully compliant with the Resource Conservation and Recovery Act (42 USC 6901 et seq.) Subpart C. The engineered facility is designed to essentially isolate the waste from the subsurface during operations of the landfill. Leachate is collected above the liners in the leachate collection and recovery system (LCRS) and disposed of into lined evaporation ponds. Below the upper system of liners is a primary leak detection and recovery system (PLDRS) to detect any leaks from the landfill. Below this is another liner underlain by a secondary leak detection and recovery system (SLDRS).

The engineered facility is designed to prevent releases to the subsurface during waste disposal and for as long as the LCRS is operational. In addition, leak detection systems verify that the ICDF LCRS operates as designed. By monitoring these systems, operators can verify that there are no releases to the subsurface.

During landfill design, a prediction was developed (considered conservative at the time) of the volume of the leachate and the expected constituent concentrations in the leachate that would be generated over time during both operational and post-closure activities based on the design inventory (ICP 2006). This formed the basis for an assessment of liner/leachate compatibility. The estimate of leachate chemical composition was used to assess worker exposure to landfill contaminants in the evaporation ponds and ensure worker protection requirements would be met. The Subsurface Transport Over Multiple Phase model was used for fate and transport simulations to ensure that the landfill design would meet remedial action objectives for groundwater (EDF-ER-274).

Routine sampling of leachate and pump station liquid and monitoring of the PLDRS and SLDRS occur in accordance with Tables 1 through 4 in the ICDF Complex Operational and Monitoring Sampling and Analysis Plan (DOE-ID 2014a). Leachate in the LCRS sump is analyzed semiannually (or quarterly based upon analytical results and corrective action evaluations) for C-14, Cl-36, Co-60, Cs-137, H-3, I-129, Np-237, Pu-238, Pu-239/240, Sr-90, Tc-99, U-233/234, U-235, U-238, and gamma-emitting.

a. The FY 2014 review is RPT-1347, in process.
radionuclide activity. Leachate is also analyzed monthly for I-129. These results are discussed in more
detail in Section 9, Iodine-129 Flux Between the Landfill and Evaporation Ponds. Leachate
concentrations from the LCRS are compared to the action limits of 80% of the evaporation pond WAC
(DOE-ID 2013a). Leachate volumes from the PLDRS and SLDRS are compared against the action
leakage rate of 1,380 gal/day (DOE-ID 2013b). Monitoring at the ICDF Landfill for FY 2010 through
FY 2014 indicates action limits were not exceeded and the landfill has not leaked.

7. EVAPORATION POND SAMPLING OF LIQUID AND SEDIMENTS

Routine sampling of evaporation pond liquid and sediments occurs in accordance with Tables 2
and 3 in the ICDF Complex Operational and Monitoring Sampling and Analysis Plan (DOE-ID 2014a).
Evaporation pond liquid is analyzed annually for C-14, Cl-36, Co-60, Cs-137, H-3, I-129, Np-237,
Pu-238, Pu-239/240, Sr-90, Tc-99, U-233/234, U-235, U-238, gamma-emitting radionuclide activity, and
other hazardous constituents as specified in the tables. Analysis for the same radionuclides occurs every
5 years for sediment in the evaporation ponds. The evaporation pond sampling results of liquid and
sediments for FYs 2010 through 2014 has been within the action limits specified in the Sampling and
Analysis Plan (DOE-ID 2014a).

8. ICDF EVAPORATION POND WATER BALANCE

The ICDF Complex includes two evaporation ponds, the west pond and the east pond. The leachate
collected in the LCRS, the PLDRS, and the SLDRS is pumped directly into the evaporation ponds. The
ICDF Evaporation Pond is also used for the disposal of CERCLA-generated aqueous waste and purge
water from well sampling at the INL Site.

The evaporation pond covers approximately 4.2 acres. Each pond has an approximate capacity of
2 M gal when the depth reaches 7 ft. The total depth of the east pond is 9 ft and the total depth of the west
pond is 8.5 ft, with an administratively established freeboard limit of 18 in. for each pond
(DOE-ID 2013a). The evaporation pond’s action leakage rate is 1,590 gal/day (DOE-ID 2013b).
Monitoring at the evaporation pond for FY 2010 through FY 2014 indicates no exceedances of the action
leakage rate.

The ICDF Evaporation Pond water balance model (EDF-9951) was built to track the monthly pond
water levels and predict future levels so they can be managed and not exceed the freeboard limit of 18 in.
As shown in the ICDF water balance graphs (Figures 10, 11, and 12), which use data through the end of
October 2014, the monthly model continues to show that the ICDF east and west pond levels should
remain well below the 18-in. freeboard depth even assuming wet years for 2015 and 2016 (about 13 in. of
rainfall each year). The combined actual pond depth measurements continue to show good agreement
with the model-calculated values depicted on the graphs.

Over the long term, leachate is the primary contributor to the evaporation pond water balance.
Other contributors are natural precipitation and liner washdown water to control contamination dispersion
from the wet-dry interface level on the liner. During dry years, makeup water may be added to the ponds
to administratively keep the ponds at a minimum depth of 3.5 ft.

Emergency storage options have been identified (EDF-9952) and would be implemented only if the
water-balance model predicts the ICDF Evaporation Ponds exceed their freeboard limit of 18 in. and after
enhanced evaporation or other water-management options have been exhausted to prevent overfilling
of the ponds. The emergency storage option would provide additional storage capacity to maintain pond
levels below the established freeboard limit of 18 in. The two viable emergency storage options include a
berm extension and modular tank storage.
Figure 10. Measured, calculated, and projected depths in the east evaporation pond.

Figure 11. Measured, calculated, and projected depths in the west evaporation pond.
The maximum activity of I-129 allowed for disposal at the ICDF Landfill is 2.40 Ci (DOE-ID 2013a). From inception of operations in September 2003 through FY 2014, an estimated 0.15 Ci of I-129 has been disposed of to the ICDF Landfill according to the data contained in IWTS database. A summary report is issued annually to the Agencies documenting the estimated I-129 flux from the ICDF Landfill to the ICDF Evaporation Pond to provide confidence that the estimated I-129 activity in waste in the landfill is not underestimated (ICP 2014). The methodology for calculating the flux of I-129 from the landfill to the evaporation ponds is documented in EDF-10627. A small fraction (approximately 0.06%) of the I-129 that is calculated to have been placed in the ICDF Landfill (0.15 Ci) has been transferred to the ICDF Evaporation Pond in the LCRS leachate (9E-05 Ci) (ICP 2014). The I-129 disposed of to the landfill is not readily available for potential leaching and subsequent transport out of the landfill.
10. GROUNDWATER MONITORING

The ICDF groundwater detection monitoring network consists of aquifer monitoring wells in the immediate vicinity of the ICDF Landfill and Evaporation Pond (see Figure 13). The Snake River Plain Aquifer is located approximately 470 ft below ground surface. ICDF was constructed downgradient and above an existing Sr-90 plume of the former INTEC injection well, which was used for the disposal of service wastewater but was sealed and abandoned in 1989. Routine use of the INTEC injection well was discontinued in 1984 when the wastewater was diverted to the INTEC percolation ponds, which received the service wastewater until late August 2002 when the INTEC percolation ponds were permanently closed. The ICDF Landfill was constructed adjacent to the former percolation ponds. When the ICDF was under construction and during its early operations, perched water existed in two layers at approximately 250 ft and 380 ft below ground surface. The chemical signatures of the perched water collected during ICDF baseline sampling indicated that the former percolation ponds were the source of the perched water (Cahn and Ansley 2004). Transducers were installed to monitor the drain out of the perched water. The perched water wells now have insufficient water for sampling, but wells continued to be checked semiannually for water during the reporting period of FY 2010 through FY 2014.

The ICDF groundwater detection monitoring network consists of one monitoring well that is upgradient and five monitoring wells that are downgradient of the landfill and evaporation pond. The ICDF Complex Groundwater Monitoring Plan (DOE-ID 2015a) details the groundwater monitoring requirements associated with the ICDF, including monitoring wells, sample frequency, required analytes, laboratory analysis, fieldwork, and quality control. The INEEL CERCLA Disposal Facility Groundwater Detection Monitoring Program: Data Analysis Plan (DOE-ID 2003d) details the approach used to evaluate the groundwater data collected in support of the ICDF detection monitoring program. The monitoring program was established to meet the substantive requirements of 40 CFR 264.97 and 40 CFR 264.98, which are applicable or relevant and appropriate requirements for this CERCLA facility.

The monitoring wells are sampled for the following indicator parameters: U-233/234, U-238, bicarbonate alkalinity as CACO₃, and sulfate. Groundwater monitoring reports are prepared annually, with the biennial report including a more detailed statistical evaluation to determine whether the detection monitoring limits should be modified. The biennial report analytical results for Calendar Years (CYs) 2010 and 2011 (DOE-ID 2012b) and CYs 2012 and 2013 (DOE-ID 2014b) and the latest annual reports summarizing CYs 2012 (DOE-ID 2013c) and 2014 (DOE-ID 2015b) indicate U-233/234, U-238, bicarbonate alkalinity, and sulfate concentrations from groundwater beneath the ICDF have not exceeded the detection monitoring limits, except for three bicarbonate alkalinity samples that were above detection monitoring limits. However, these samples were found to be within the range of naturally occurring bicarbonate alkalinity concentrations and were considered to be false positives not attributable to ICDF operations (DOE-ID 2014b). Groundwater monitoring results do not indicate any leakage from the ICDF. Operations and maintenance activities at the ICDF are protective of the Snake River groundwater aquifer.
Figure 13. Idaho CERCLA Disposal Facility layout, well locations, and former percolation ponds.
11. NESHAP COMPLIANCE REPORTING

The National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 61, Subpart H, limits the effective dose equivalent caused by radionuclides released into the ambient air from the INL Site to 10 mrem/year to any member of the public and a target for the total dose from each facility to less than 1 mrem/year (DOE-ID 2013a). Compliance with the dose standard must be demonstrated using annual emission estimates and U.S. Environmental Protection Agency-approved dose assessment codes. To support INL Site-wide NESHAP compliance, CH2M-WG Idaho, LLC, (CWI) provides estimates of emissions from its CERCLA operations at the ICDF Complex for use in preparing INL Site NESHAP annual reports.

The methods for calculating air emissions from the ICDF are documented in EDF-2236 for the landfill and in EDF-10256 for the evaporation ponds under normal operating conditions and in EDF-9993 for enhanced operations at the evaporation ponds to address emissions from spray evaporation (during years when the spray evaporation system is used). All actions at the ICDF Complex having the potential of releasing radionuclides into the ambient air are assessed. Landfill operations associated with handling of contaminated soil are expected to contribute the majority of the radionuclide emissions. Other quantifiable emissions are associated with handling of CERCLA-generated aqueous waste that will be sent to the evaporation ponds and other waste treatments (EDF-2236). The air emissions models and methods described in EDF-2236 for estimating gaseous and particulate material emissions from the landfill operations are applicable for ICDF operations involving contaminated soil (i.e., not containerized waste) and are implemented in an IWTS report.

The cumulative total dose for air emissions from the ICDF Complex during CY 2014 from two sources (the spray evaporator was not used in CY 2014), i.e. the ICDF Landfill (6E-05 mrem/year) and the ponds (1E-05 mrem/year), was 7E-05 mrem/year, well below the 10-mrem/year NESHAP compliance standard (40 CFR 61, Subpart H) and the ICDF Complex target of 1 mrem/year (DOE-ID 2013a) (EDF-10717). The cumulative total dose for air emissions from the ICDF Complex for previous CYs 2013, 2012, 2011, and 2010 were also well below the 10-mrem/year NESHAP compliance standard (40 CFR 61, Subpart H) and the ICDF Complex target of 1 mrem/year (DOE-ID 2013a) (EDF-10590; EDF-10451; EDF-10256; EDF-9630).

12. SUMMARY

This report summarizes the activities and monitoring over the last 5 years, including FYs 2010 through 2014, that support the determination that the ICDF Complex remedy is protective of human health and the environment and is functioning as intended during the operational phase.
13. REFERENCES


DOE-ID, 2003c, INEEL CERCLA Disposal Facility Complex Compliance Demonstration for DOE Order 435.1, DOE/ID-10956, Rev. 0, U.S. Department of Energy Idaho Operations Office, August 2003. (Note: This document has subsequently been updated to Rev. 2, November 2007.)


