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Review of the Mixed Hazardous Radioactive CERCLA Waste Cleanup Policy at the Radioactive Waste Management Complex Subsurface Disposal Area Department of Energy's Idaho National Laboratory

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on behalf of
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Abstract

This report lays out the Department of Energy's Idaho National Laboratory Radioactive Waste Management Complex/Subsurface Disposal Area CERCLA cleanup process and the policy decisions that went into how DOE is compromising Idaho's water future. How did we get to where we are today and why DOE is leaving hazardous nuclear waste buried at the INL and calling it "clean enough"? DOE's decision to leave 90% of the buried waste in the dump and violate the 1995 Settlement Agreement and Federal Court Consent Order with the State of Idaho is a crucial threat to our states' safe water future by failing its commitment to cleanup its nearly 70 year nuclear legacy waste. DOE's priority to spent >$1 trillion on building new nuclear weapons rather than spent only $ ~600 million to cleanup the huge environmental disaster from the last nuclear production legacy. This represents the warped priority and values the federal government places on Idaho's water future that is unconscionable by any health and human rights standards.

This report also reviews both the policy setting Environmental Supplement Analysis for the Treatment of Transuranic Waste and the Record of Decision for the RWMC because they both cover the same policy area and contain the same fundamental flaws related to the DOE's mismanagement of the RWMC. EDI's primary focus is on the existing legacy waste, the problems with the "Accelerated Retrieval Program" intended to remediate the dump (illegally leaving mixed hazardous/radioactive waste in-place) and the importation of additional TRU waste to INL from other DOE nuclear sites.

At risk is the underlying Snake River sole source aquifer that most of Idahoans are and will be dependent on for millennia. Radioactive and hazardous waste continues to migrate from this buried waste contaminating the aquifer; so without a comprehensive cleanup required by law DOE is compromising Idaho's future in order to save money for more nuclear weapons. Mixed radioactive waste is the most hazardous and biologically dangerous material in the world. When DOE wants to treat it with less environmental protection (when miniscule particles can cause death) than garbage, the public must take action to ensure an appropriately adequate cleanup even when current state leadership no longer will confront DOE like former Governors' Andrus and Batt.

DOE continues to demonstrate a consistent pattern of violations of environmental laws, hazardous waste regulations and the 1995 Settlement Agreement Federal Court Consent Order. The following are examples:

1. Changed the definition of what waste is to be removed from the RWMC/SDA from "all TRU and Low-level Alpha" (*a*LLW) * to only "stored TRU" and continuing to allow *a*LLW (formerly TRU) to remain buried at the SDA stipulated in the 1995 Settlement Agreement and Consent Order for removal;
2. Even the *a*LLW "stored" on Pad A originally classified in as TRU (>10 nCi/g) * is left in place;
3. Offers no independent data confirming what waste left in the SDA is not TRU and that the alpha detection methods used in ARPS can accurately detect TRU;
4. Violates Land Disposal Regulations (LDR) in: IDAPA 58.01.05.009 and 58.01.05.011; 40 CFR 265.13 and 268.7; and NRC under 10 CFR part 61 to include:
   a. Leaving SDA surface waste pile on Pad A waste in place;
   b. Leaving 90% of SDA buried mixed hazardous/radioactive waste in place;
   c. Once a waste dump is remediated, all the contaminated material –including soil – is considered a new waste and thus must be managed according to RCRA/NRC Land Disposal Regulations;
5. Continues SDA burial in the "Active LLW" in a flood zone in violation of Land Disposal Regulations;
6. Use economic leverage as largest employer to capture State leadership, EPA and IDEQ to compromise policy and commitments to former Governors' Andrus, Batt 1995 Settlement Agreement and the public to cleanup buried nuclear waste that continues to contaminate the underling Snake River Aquifer.

* Alpha Low-Level Waste (αLLW): Waste that was previously classified as transuranic (TRU) waste but has a transuranic concentration lower (>10 nCi/g) than the currently established limit for transuranic waste (>100 nCi/g). Alpha low-level waste requires additional controls and special handling (relative to low-level waste). This waste stream cannot be accepted for onsite disposal under the current waste acceptance criteria; therefore, it is special-case waste. Plutonium-238, 239, 240, 241, Amercium-241and 243 and Neptunium are examples of transuranic elements that can be present in alpha Low-Level waste. Radiation exposures caused by inhalation of plutonium are 6.7 million times greater than equivalent exposures of depleted uranium—internal exposure of only 1 microgram of plutonium exceeds the allowable exposure limits established by DOE.

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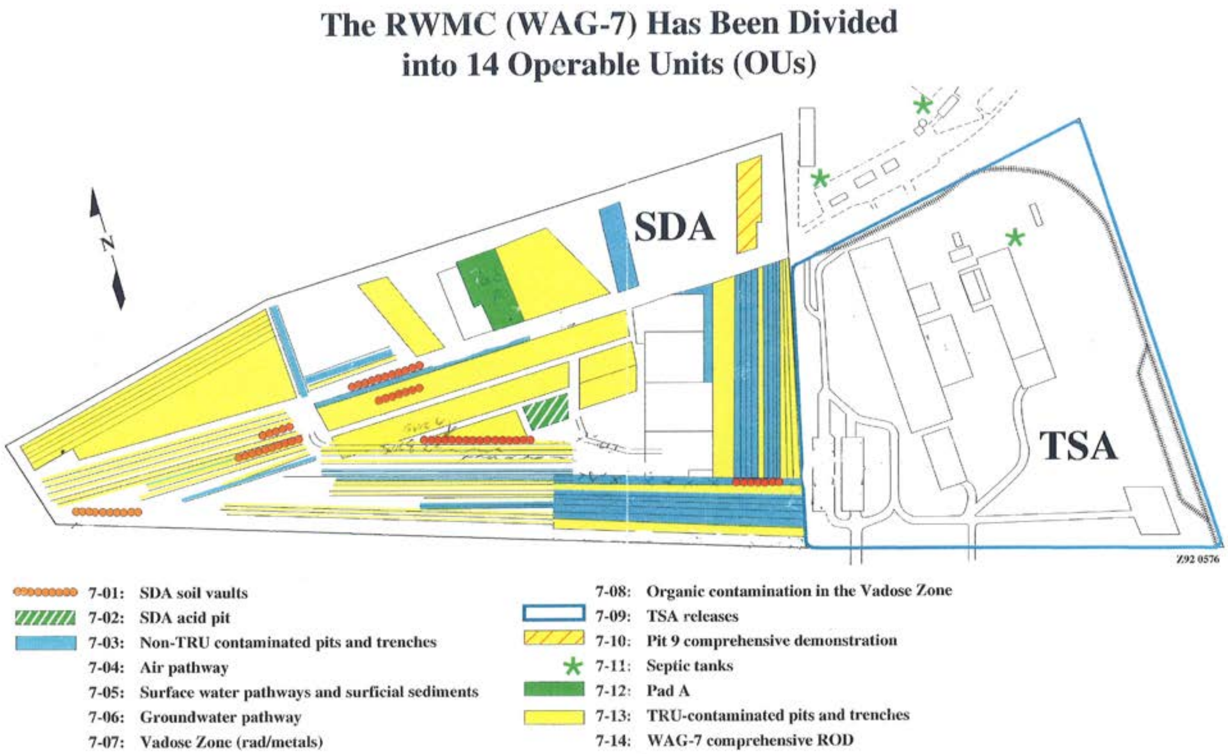

DOE/INL Document No. Z920576 above shows the 14 new Radioactive Waste Management Complex Subsurface Disposal Area (SDA) and Transuranic Storage Area (TSA) for INL CERCLA Waste Area Group 7 cleanup Operable Units that separate the various remediation units 1 through 14.

An aerial view of the Idaho Site's Radioactive Waste Management Complex showing the temporary Accelerated Retrieval Project (ARP) buildings in the Subsurface Disposal Area and the Transuranic Storage Area and treatment buildings. [DOE photo]

Section I. Background

This report provides additional details to Environmental Defense Institute's (EDI) previous reports; "What is Buried at Idaho National Laboratory's (INL) Radioactive Waste Management Complex Subsurface Disposal Area (RWMC/SDA), Five Year CERCLA Review," [1] "Waste Area Group (WAG) 7 CERCLA Cleanup INL for U. S. Department of Energy (DOE), submitted 2016." [2] This review assesses both the 2008 Supplement Environmental Analysis and the Record of Decision because they both cover the same area of policy and contain the same fundamental flaws related to the DOE's mismanagement of the RWMC by allowing DOE's remedial program to leave 90% of the buried waste in place. EDI's primary focus is on three issues; 1.) the existing legacy waste; 2.) the "Accelerated Retrieval Program" problems (leaving mixed hazardous/ radioactive waste in-place); and 3.) the issues intrinsic in the new radioactive TRU waste DOE is to importing listed in Table 1 below to the RWMC. Buried legacy radioactive waste issues as a whole at INL are politically and intrinsically interrelated with importing new waste because of the enormous environmental impact that will last for millennia. As the Department of Energy states:

> "This Supplement Analysis (SA) addresses a Proposed Action to centralize the treatment and characterization of transuranic (TRU) waste from several [14] U.S. Department of Energy (DOE) sites at DOE'S Idaho National Laboratory (INL), prior to disposal at the Waste Isolation Pilot Plant (WIPP)." "In order to dispose of TRU waste at WIPP, DOE needs to characterize the waste to determine that it meets WIPP Waste Acceptance Criteria, treat and package the waste as necessary, and transport it to WIPP. DOE has a continuing need to minimize operating costs of its TRU Waste Management Program, while preserving high quality characterization, treatment, and disposal operations. A number of DOE sites have small amounts of TRU waste and/or lack the costly facilities necessary to process the waste in compliance with State of New Mexico, U.S. Environmental Protection Agency, and WIPP requirements. DOE needs to use existing, specialized facilities at INL to prepare the waste from other sites for disposal at WIPP, because setting up duplicative characterization or other necessary facilities at other sites would not be practical or cost effective." [3]

EDI's review also covers DOE's RWMC Record of Decision Statement of Purpose that states:

> "This decision document presents the Selected Remedy for Radioactive Waste Management Complex (RWMC) Operable Unit (OU) 7-13/14 at the Idaho National Laboratory Site. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record file for this site." [4]

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[1] CERCLA, Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1986, as amended by the Superfund Amendments and Reauthorization Act, the National Oil and Hazardous Substances Pollution Contingency Plan are the U. S. Congress' response to huge environmental contamination sites. Subsequently, Congress passed the Federal Facility Compliance Act that forced government agencies (like the DOE) to comply with these environmental laws and legally enforceable Consent Orders.

[2] Chuck Broscious, 1.) Comments on Agreement to Implement Plan for Buried Radioactive Waste Idaho National Laboratory OU-7-13/14 (7/13/08). 2.) Five Year Review CERCLA Cleanup Operational Unit (OU-7-13/14) Draft Supplemental Analysis for Two Proposed Shipments of Commercial Spent Nuclear Fuel To Idaho National Laboratory for Research and Development, July 30, 2015. 3.) What is Buried at Idaho National Laboratory's Radioactive Waste Management Complex Subsurface Disposal Area March 1, 2016? http://environmental-defense-institute.org/publications/EDICERCLARWMCRevG.pdf

[3] Supplement Analysis for the Treatment of Transuranic Waste at the Idaho National Laboratory, Pg. 1, February 2008. Hereinafter DOE/EIS-0200-SA03. DOE prepared this SA of the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F), May 1997) (Also called WM-PEIS).

[4] Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14, *Revision 0 September 2008, Pg. iii,* DOE/ID-11359.

What is Transuranic (TRU) Waste that DOE is Shipping to Idaho?

"TRU waste is waste that contains alpha particle-emitting radionuclides with atomic numbers greater than uranium (92) and half-lives greater than 20 years in concentrations greater than 100 nano-curies per gram of waste. TRU waste is categorized as either contact-handled (CH-TRU) or remote-handled (RH-TRU), based on the radiation level at the surface of the waste container. The WIPP, located near Carlsbad, New Mexico, is the only facility permitted to dispose of DOE'S TRU waste generated by defense activities." [5] Plutonium-238, 239, 240, 241, Amercium-241, 243 and Neptunium are also transuranic elements.

Where is This New TRU Waste Coming From?

Table 1. CH-TRU and RH-TRU Waste Volumes Shipped to INL [6]

Waste Generator Sites	TRU Waste Volume (cubic meters) a.	
	CH-TRU	**RH-TRU**
Argonne National Laboratory (ANL), IL	88	43
Bettis Atomic Power Laboratory (BAPL), PA	70	4
Babcock & Wilcox (BW), Lynchburg, VA	46	
General Electric - Vallecitos Nuclear Center (GE-VNC), Sunol, CA	35	105
Hanford Reservation, WA	6,500	
Knolls Atomic Power Laboratory (KAPL), Schenectady, NY		83
Knolls Atomic Power Laboratory - Nuclear Fuel Services (K-NFS), TN	130	
Lawrence Berkeley National Laboratory (LBNL), CA	1	
Lawrence Livermore National Laboratory (LLNL), CA	1,125	
Nevada Test Site (Nl'.S), NV	670	
NRD L.L.C., (NRD), Grand Island, NY	15	
Paducah Gaseous Diffusion Plant, KY	4	
SNL, Albuquerque, NM	30	20
Separations Process Research Unit (SPRU), Schenectady, NY	50	
Total	8,764	255

a. Source: Inventory data gathered for 2009 WIPP Compliance Recertification Application update. Only the portion of the Hanford waste inventory that could be expected to move to INL is included for Hanford.

Comparing the Record of Decision (ROD) list [7] with the SA-03 Table 1 list above reveals at least 2 additional shippers not in the ROD; Babcock & Wilcox, Lynchburg, VA, NRD L.L.C., Grand Island, NY. There is no apparent explanation of weather more sites will be added that may violate the ROD. Also, at least 6 of the above waste importers appear to be commercial sources that violate the 1995 Settlement Agreement that prohibits importing commercial radioactive waste to Idaho discussed more below. Public awareness of Idaho's nuclear waste crisis is not being informed by the commercial media because of the economic aversion reinforced by DOE and its contractor's control as the largest employer and comparative enormous financial injections into a relatively poor local economy.

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[5] DOE/EIS-0200-SA03, Pg. 2.

[6] DOE/EIS-0200-SA-03, pg. 2.

[7] Amendment to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste issued on January 20, 1998 (63 FR 3629), and amended previously including on December 29, 2000 (65 FR 82985), and June 30, 2004 (69 FR 39446).

Important Long-Lived Contaminants at INL's RWMC Not Remediated [8]

Table 2: Radionuclide and chemical contaminants at RWMC for 1000 year and 10,000 year groundwater ingestion peak risk estimates and groundwater concentrations, un-remediated.

Radionuclide (half-life)	Inventory Curies (Ci) g = grams	Source[a]	Peak Risk	Calendar Year	Peak Aquifer Concentration (Percent of MCL)*	EPA Maximum Contaminant Level *
Am-241 (432 yr)	243,000 Ci [h]	RFP	3E-3 [b]	3010	6.8E-8 (< 1 percent)	15 pCi/L
C-14 (5,730 yr)	731 Ci [h]	INL	1E-5	2133	186 **9.3 percent**	2000 pCi/L
Cl-36 (301,000 yr)	1.66 Ci [h]	INL	2E-6	2395	21.2 3 percent	700 pCi/L
I-129 (17,000,000 yr)	0.188 Ci [h]	INL	4E-5	2111	13.1 **1310 percent**	1 pCi/L
Tc-99 (2213,000 yr)	42.3 Ci [h]	INL	3E-4	2111	2710 **301 percent**	900 pCi/L
Np-237 (2,144,000 yr)	0.141 Ci [h]	INL	1E-4	12000	86.8 **579 percent**	15 pCi/L[c]
U-238 (4,470,000,000 yr)	148 Ci [h]	RFP [a]	9E-5	12000	47.1 **472 percent**	1.01E1 pCi/L [d]
Total Uranium[c]			NA	12000	1.44E-1mg/L **480 percent**	3.00E-2 mg/L [e]
Carbon Tetrachloride	7.9E8 g	RFP	5E-4	2133	3.07E-1 mg/L **6,140 percent**	5.0E-3 mg/L
1,4-Dioxane	1.87E6 g 4.24E4 g	RFP INL	2E-5	2111	1.69E-01 mg/L **5,633 percent**	3E-3 mg/L
Methylene chloride	1.41E7 g	RFP	5E6	2245	5.85E-2 mg/L **1,170 percent**	5E-3 mg/L
Nitrate	4.06E8 g 4.97E7 g	RFP INL	(Hazard index 1)	2094	66.7 mg/L **667 percent**	10 mg/L
Tetrachloro-ethylene	9.87E7 g	RFP	7E-7	2145	6.64E-2 mg/L **1,328 percent**	5.0E-3 mg/L
Trichloroethylene	8.92E7 g	RFP	9E-4	2130	3.8E-2 mg/L **760 percent**	5.0E-3 mg/L

Table 2: Sources: Remedial Investigation and Baseline Risk Assessment for Operable Unit 7 13/14, May 2006, sections 4 and 7, DOE-ID-11241.
* MCL= maximum concentration levels allowed by EPA regulations.
(a. Rocky Flats Plant (RFP); Idaho National Laboratory (INL); (b. The peak risk for Americium-241 is due to external exposure, soil ingestion, inhalation and crop ingestion. The risk for the other contaminants is primarily groundwater pathways); (c. The limit is 15 pCi/L for total alpha (40 CFR 141); (d. The limit is 3.0E-2 mg/L (30 microgram/L) for total uranium. To compare concentrations of uranium isotopes, 3E-2 mg/L is converted to the equivalent activity for each isotope; (e. Total uranium is presented for comparison to the maximum contaminant limit; (f. Table 4-4 of the RI/BRA shows that most of the U-238 waste is from Rocky Flats. Of this, 24.9 curies of U-238 was placed on SDA Pad A which is not currently planned to be removed; (h. the curie amounts are the amounts assumed to remain buried based on the available performance assessments for the migration of contaminants.

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8 Tami Thatcher EDI special report, *Important Long-Lived Contaminants at INL's RWMC Not Remediated* http://environmental-defense-institute.org/publications/RWMCunrem.pdf

Where on INL/Radioactive Waste Management Complex is all this new waste going?

> "At INL, the CH-TRU [contact-handled] waste would be treated by compaction at the Advanced Mixed Waste Treatment Facility (AMWTF) to reduce the volume of the waste, and characterized for shipment to WIPP [Waste Isolation Pilot Plant]. The RH-TRU [remote-handled] waste would be treated during repackaging to remove prohibited items, and characterized for shipment to WIPP at the Idaho Nuclear Technology and Engineering Center (INTEC), which is located on the INL site." [9]
>
> "Waste would be accepted at INL for treatment and characterization only if that could be done in accordance with the provisions of the settlement agreement in *Public Service Company of Colorado* v. *Batt* (the Settlement Agreement with the DOE and the State of Idaho entered into in 1995, hereinafter referred to as the Idaho Settlement Agreement) and the Site Treatment Plan. The Idaho Settlement Agreement allows TRU waste from other DOE sites to be treated at INL if it is treated within 6 months of receipt and shipped out of Idaho within 6 months of treatment. Under the Proposed Action, DOE would continue to remove TRU waste currently stored at INL in accordance with the terms of the Idaho Settlement Agreement." [10]

The above statement "The RH-TRU [remote-handled] imported (non-INL) waste would be treated during repackaging to remove prohibited items…" raises unanswered questions as to what is done with the "prohibited items" in the imported waste. Specifically, are "prohibited items" dumped in the open Active Pits or soil vaults in the SDA? DOE offers: "WIPP-prohibited items were either returned to the pit or containerized for further processing. Liquids were absorbed using soil or other suitable absorbents." [11] Now DOE wants the imported TRU waste "6 mo. in/ 6 mo. out" requirement waived. This would be another violation of the below 1995 Settlement Agreement [12] and is a crucial issue in light of DOE's program discussed above in the Record of Decision to import new waste to the INL. Only the federal government has the power and economic leverage to violate its own laws with impunity or in its own words claiming "sovereign immunity." [13] This is discussed more below.

II. 1995 Settlement Agreement and Consent Order

It is crucial to review the RWMC cleanup issue context prior to 1995, when then Governor Cecil Andrus came to the understandable conclusion that DOE/INL was using "Idaho as a nuclear waste dump." [14] The predecessor agency to DOE – Energy Research & Development Administration (ERDA) had released in 1977 the first INL Environmental Impact Statement required under the newly passed National Environmental Policy Act. [15] This EIS documented the massive extent of nuclear operations and

9. ibid. DOE/EIS-0203-F-SA-03, Pg.2.

10 ibid. DOE/EIS-0200-SA03, pg. 4.

11 DOE-ID-11396, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals October 2014, Rev 3, Pg. 52, DOE-ID-11396

12 1995 Settlement Agreement, Pg.5, Section, "2.a. Treatment of Non-INEL Wastes. Any and all Treatable Waste shipped into the State of Idaho for treatment at the Facility shall be treated within six months of receipt at the Facility, with the exception of two cubic meters of low-level mixed waste from the Mare Island Naval Shipyard which will complete base closure for nuclear work in 1996." "Any transuranic waste received from another site for treatment at the INEL shall be shipped outside of Idaho for storage or disposal within six months following treatment."

13 Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Revision 6A, Pg. 5-7.

14 Associated Press, "Idaho accuses feds of hiding INEL info, Boise-The State of Idaho is accusing the Energy Department of illegally concealing documents and evidence in its attempt to avoid conducting a full-scale environmental investigation into nuclear waste operations at the Idaho National Engineering Laboratory." "Evidence known to the Department of Energy but which it did not disclose publicly, establishes that substantial questions surrounding the proposal's impacts on the quality of human environment." Lewiston Tribune, August 1, 1992.

15 ERDA-1536; Waste Management Operations, INEL Final Environmental Impact Statement, US Energy Research & Development Administration, September 1977.

accumulation of significant hazardous/radioactive waste. This EIS however failed to "consider various health and safety factors." In 1992 DOE planned to ship used spent reactor fuel from the Public Service of Colorado's Fort St. Vrain that was closing to INL as they had been doing for decades since INL[16] opened in 1949.

Then Governor Cecil Andrus [17] and the Shoshone-Bannock Tribes [18] filed law suits in Federal District of Idaho under the clean air laws to block the shipment of nuclear waste from the closed power plant in Colorado. Idaho won their suit but the Tribes lost. Idaho's suit was appealed to the 9th US Circuit Court of Appeals by Public Service of Colorado.

> "The 9th US Circuit Court of Appeals ordered the lifting of US District Judge Edward Lodge's injunction against storage of that waste at the federal facility in Idaho. The state has been fighting the shipments since 1989. Meanwhile, Idaho Gov. Cecil Andrus said the state has several possible responses to the ruling, such as tightening up ambiguous state environmental regulations through the Legislature or even going to the US Supreme Court. USDOE has said in federal court papers that it would not resume shipments to Idaho until it completes an environmental impact statement of the transportation route at the request of the Shoshone-Bannock Tribes. Attorney General Larry EchoHawk said his office could petition for a rehearing of the case, or ask for a review by the US Supreme Court. 'They're speaking for a lot of people when they say Idaho shouldn't be a nuclear waste dump.'" [19]

Governor Andrus and his successor Philip Batt subsequently were able, together with then DOE Secretary James Watkins, to go back to federal court and hammer out an agreement that both the government and Idaho could agree on that became the 1995 Settlement Agreement and Consent Order enforceable by US Federal District Court that states in pertinent part:

1995 Settlement Agreement

"**Section B. Transuranic Waste Shipments Leaving Idaho** [emphasis added]

1. DOE shall ship **all transuranic waste** now located at INEL, currently estimated at 65,000 cubic meters in volume, to the Waste Isolation Pilot Plant (WIPP) or other such facility designated by DOE, by a target date of December 31, 2015, and in no event later than December 31, 2018. DOE shall meet the following interim deadlines:
   a. "The first shipments of transuranic waste from INEL to WIPP or other such facility designated by DOE shall begin by April 30, 1999.
   b. "By December 31, 2002, no fewer than 3,100 cubic meters (15,000 drum equivalents) of transuranic waste shall have been shipped out of the State of Idaho.

ERDA-1552; Final Environmental Impact Statement, Safety Research Experiment Facilities, INEL, September 1977, US Energy Research & Development Administration.

[16] The INL site was first named in 1949 the National Reactor Testing Station that subsequently built/tested 52 reactors for Naval, Army and commercial power. See EDI's Citizens Guide to INL for an operating history of the site and documented types/volumes and locations of waste dumped at the site based on FOIA receipts. http://www.environmental-defense-institute.org/publications/GUIDE.963.pdf

[17] US District Court for the District of Idaho, Case No. CV 91-0423-E-EJL, Idaho Department of Health &Welfare vs. US Department of Energy.

[18] US District Court for the District of Idaho, Case No. CV 91-0436-E-EJL, Shoshone-Bannock Tribes vs. US Department of Energy.

[19] Bob Egelko of the Associated Press, Feds reject Idaho ban on nuclear waste, Andrus retrenches, considers taking case as far as US Supreme Court, Lewiston Tribune March 24, 1992

c. After January 1, 2003, a running average of no fewer than 2,000 cubic meters per year shall be shipped out of the State of Idaho.

2. "The sole remedy for failure by DOE to meet any of these deadlines or requirements shall be the suspension of DOE spent fuel shipments to INEL as set forth in Section K.1."

"**Section E. Treatment and Transfer of Existing Wastes at INEL**

2. "**Mixed Waste Treatment Facility**. DOE shall, as soon as practicable, commence the procurement of a treatment facility ("Facility") at INEL for the **treatment of mixed waste, transuranic waste and alpha-emitting mixed low-level waste** ("Treatable Waste"). DOE shall execute a procurement contract for the facility by June 1, 1997, complete construction of the Facility by December 31, 2002, and commence operation of the Facility by March 31, 2003. Commencement of construction is contingent upon Idaho approving necessary permits." [emphasis added]

"Section G. INEL Environmental Restoration Program

"**1. INEL Environmental Restoration Program to Continue**. DOE shall continue to implement the INEL environmental restoration program in coordination with Idaho and EPA. Such implementation shall be consistent with the schedules contained in the Federal Facilities Agreement and Consent Order (FFA/CO) entered into with the State of Idaho, EPA and DOE, and it shall include schedule requirements developed pursuant to the completed and future records of Decision under the FFA/CO. The sole remedies for failure to implement the environmental restoration activities specified in the FFA/CO shall be those specified in the FFA/CO." [20] [emphasis in original] [Pg.8]

DOE's nuclear waste interned at INL includes all the classifications; a.) high-level used spent nuclear reactor fuel (SNF), calcine high-level waste, 900,000 gal. of formerly high-level radioactive sodium-bearing [21] liquid tank wastes from reprocessing SNF; b.) transuranic (TRU) waste; c.) alpha-low-level, low level waste (Class A, B, C or greater than class C); d.) mixed radioactive hazardous (RCRA) waste.[22] [23] All of these wastes classifications were covered in the 1995 Settlement Agreement because DOE had demonstrated its intransigence in fulfilling commitments to the State of Idaho in previous decades. [24] Specifically, DOE chose to interpret the removal of transuranic (TRU) waste to mean only the above ground

[20] 1995 Settlement Agreement; The State of Idaho, through the Attorney General, and Governor Philip E. Batt in his official capacity; the Department of Energy, through the General Counsel and Assistant Secretary for Environmental Management; and the Department of the Navy, through the General Counsel and Director, Naval Nuclear Propulsion Program, hereby agree on this 16th day of October, 1995, to the following terms and conditions to fully resolve all issues in the actions Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL (D. Id.) and United States v. Batt, No. CV-91-0065-S-EJL (D. Id.) Pg. 2 &5& 8: Hereinafter 1995 Settlement Agreement. http://deq.idaho.gov/media/550338-1995_Settlement_Agreement.pdf

[21] DOE unilaterally reclassified 900,000 gal. sodium-bearing liquid waste in INL/INTEC underground tanks from high-level as identified in Idaho High-Level Waste & Facility Disposition Final Environmental Impact Statement, 2002, (DOE/EIS-0287) to mixed low-level waste. EDI joined NRDC in a suit challenging this action. See: Civ. No. 01-0413-S-BLW.

[22] RCRA, Resource Conservation Recovery Act, is primary law to regulate all types of hazardous waste including mixed-hazardous radioactive waste treatment and disposal.

[23] A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste Buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983 Volume 1, August 1995, INEL-95/0310, (Formerly EGG-WM-1 0903), Tables S-1 and 2.

[24] ERDA-1536; Waste Management Operations, INEL Final Environmental Impact Statement, US Energy Research & Development Administration, (predecessor to DOE) September 1977 and; ERDA-1552; Final Environmental Impact Statement, Safety Research Experiment Facilities, INEL, September 1977, US Energy Research & Development Administration. These EISs committed to cleaning up INL but DOE failed to comply with these commitments, thus Andrus was justified to distrust DOE without a court order.

stored waste. Idaho was forced to go back to court for clarification of this crucial issue. District Judge Edward Lodge issued the following decision on this question:

> "During 2003, U.S. District Judge Edward Lodge issued a decision in the court case which asked for clarification of the word "all" in the 1995 Settlement Agreement. The state insisted that "all" transuranic waste included waste buried at the INEEL before 1970, while the Department of Energy defined "all" as only that waste that was stored above ground."
>
> "Judge Lodge, who reviewed the Settlement Agreement in 1995, affirmed the state's contention in his statement, 'The Court finds that the 1995 Settlement Agreement makes up the entirety of the parties agreement and is clear and unambiguous. The express language of the Agreement when taken as a whole expressly requires that all transuranic waste be removed from INEEL.
>
> "The parties specifically define transuranic waste without any limitations as to its location within INEEL nor any limitations as to amount.'" [25] [26] [emphasis added]

After hearing that DOE planned to ship new SNF nuclear waste to INL in violation of 1995 Settlement Agreement former Governor Andrus, who initiated the Settlement Agreement, stated in a "dear friend letter" published in Idaho Falls that states in part:

> "As you know, I have happily spent many years of my life serving Idaho and her citizens. As your 4-term governor elect, one of my proudest achievements was opposing efforts by the federal Department of Energy to use Idaho as a dumpsite for nuclear waste – laying the groundwork for my successor and friend, Governor Phil Batt, to negotiate the historic 1995 Batt Agreement.
>
> "This Agreement clearly states that *no new commercial nuclear waste will be brought to Idaho.* So when DOE made known its plans to shirk *clear* legal commitments made to you, Idaho's citizens, and ship commercial nuke waste to the Idaho National Laboratory – which is perched just above the Snake River Plain aquifer – Governor Batt and I knew we needed to act." [emphasis in original] [27]

DOE has been trying to amend every part of the original 1995 Idaho Settlement Agreement; not only to increase spent nuclear fuel shipments to INL, import more commercial nuclear waste, miss stipulated crucial milestones for treating liquid highly radioactive liquid waste, reduce by (90%) the amount of buried TRU retrieved and all the low-level alpha waste [28] retrieval from the INL Radioactive Waste Management Complex Subsurface Disposal Area (RWMC/SDA); but also attempt to extended completion milestones and the above stated time limit of 6 months to ship new waste back out of Idaho. Idaho Attorney General Lawrence Wasden is resisting this extension, concerned (for good reason) that DOE will - as Andrus forecast – "continue making Idaho a defacto nuclear waste dump." [29]

Even DOE's own Final Waste Management Programmatic Environmental Impact Statement for Managing

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[25] State of Idaho Oversight Monitor September 2004, Pg. 4.

[26] "…judge agreed with the State, finding "unless something is encountered that would prohibit its removal, the 1995 agreement obligates the United State to remove all transuranic wastes...," including waste in the SDA." DEQ pub https://www.deq.idaho.gov/media/552764-newsletter_1106.pdf

[27] Cecil D. Andrus, Governor of Idaho 1971-1977 and 1987-1995 and U.S. Secretary of the Interior under President Jimmy Carter from 1977 to 1981, Dear Friend letter October 13, 2015 published in Post Register.

[28] Alpha Low-Level Waste: Waste that was previously classified as transuranic waste but has a transuranic concentration lower than the currently established limit for transuranic waste. Alpha low-level waste requires additional controls and special handling (relative to low-level waste). This waste stream cannot be accepted for onsite disposal under the current waste acceptance criteria; therefore, it is special-case waste. DOE/EIS-0203-F. https://digitalcommons.usu.edu/govdocs/368

[29] It is relevant to discuss some of the spent nuclear fuel issues, and the State of Idaho's suspension of allowing research quantities of SNF to be shipped to INL (stipulated in the 1995 Settlement Agreement (Section B.2) as the remedy for violation of the court order, which ID Attorney General Laurence Wasden would not sign a waiver for (as of this writing).

Treatment, Storage and Disposal of Radioactive and Hazardous Waste (WMPEIS) Transuranic Waste Alternatives Table in PEIS and the Preferred Decentralized Alternative is consistent with the 1995 Settlement Agreement were the PEIS states:

> "All TRUW [transuranic waste at INL] would be shipped to WIPP for disposal. An important change from the No Action Alternative is that retrievably stored TRUW would be treated under this alternative, whereas it would not be treated under the No Action Alternative." 30

The new AGREEMENT TO IMPLEMENT U.S. DISTRICT COURT ORDER DATED MAY 25, 2006 [31] commonly called the "2008 Agreement to Implement" filed on July 1, 2008, between the State of Idaho and the Department of Energy (DOE) is a legally binding agreement in U.S. Federal District Court. This new "Agreement to Implement" signed by current Governor Otter significantly undermines DOE/INL buried radioactive waste removal obligations specified in the original 1995 Settlement Agreement by allowing DOE to leave most of the buried radioactive waste in place. Governor Otter is capitulating to DOE by vacating crucial parts of the original 1995 Settlement Agreement with DOE that stipulated that: "DOE shall ship <u>all</u> transuranic waste now located at INEL, currently estimated at 65,000 cubic meters in volume." Governor Otters Agreement to Implement states in relevant part:

> "The Parties hereto enter this Agreement in full and final settlement of the current dispute between the Parties in the matter entitled *Public Service Company of Colorado v. Batt*, CV-91-0035-S-EJL and CV 91-0054-S-EJL2, <u>regarding the interpretation of Paragraph B.1 of the October 17, 1995 Settlement Agreement and Consent Order</u> which is attached hereto as Appendix A." [Pg. 1] [emphasis added]
>
> "In executing this Agreement, the Parties agree to the following:
>
> A. On October 17, 1995, the Parties to this Agreement entered into the 1995 Settlement Agreement, which was subsequently entered as a Consent Order in the matter entitled *Public Service Company of Colorado v. Batt*, CV-91- 0035-S-EJL and CV 91-0054-S-EJL.
>
> B. On April 18, 2002, Idaho sought to re-open the above-entitled matter seeking a declaratory ruling that Paragraph B.1 of the 1995 Settlement Agreement applied to "Transuranic Waste" located in the SDA at the INL3.
>
> C. A trial was conducted before the Court in the above-captioned matter on February 6-10, 2006.
>
> D. On May 25, 2006 the Court entered a Memorandum Decision and Judgment establishing the responsibilities of DOE under the 1995 Settlement Agreement with respect to Transuranic Waste buried in the Subsurface Disposal Area.
>
> E. On July 24, 2006 the United States Department of Energy appealed the decision to the Ninth Circuit Court of Appeals. On March 17, 2008, the Ninth Circuit Court of Appeals affirmed the decision of the District Court."
>
> F. Since the filing of the Motion to Re-open in 2002 and the date of this Agreement, DOE, Idaho and the United States Environmental Protection Agency (EPA) have continued to evaluate environmental hazards posed by the Subsurface Disposal Area and Transuranic and other wastes disposed of there. In furtherance of that evaluation, DOE conducted comprehensive reviews of shipping and disposal records, which information was compiled in the WILD Database, and generated maps showing the locations of waste forms in the SDA. In reaching this agreement, DOE and Idaho base their knowledge of waste locations on the WILD database and maps generated by DOE on or before February 28, 2007. Copies of these maps have been lodged with Idaho and shall be kept throughout the duration of this Agreement. Idaho's participation in this Agreement is based upon the representation by DOE that the information

[30] DOE/EIS-0200-F, The Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage and Disposal of Radioactive and Hazardous Waste, U.S. Department of Energy, Office of Environmental Management (WM PEIS), Summary, Section 8.3.2, DOE/EIS-0200-F. Also Transuranic Waste Alternatives Table in PEIS shows all alternatives S = storage after treatment for one year, prior to transportation for disposal, for all alternatives except No Action or store current inventory under review. Page 8-20 VOLUME I. April 1995. This EIS is cited in the 1995 Idaho Settlement Agreement and relies on its definitions of radioactive waste. Available at various websites including *All U.S. Government Documents (Utah Regional Depository).* Paper 368. https://digitalcommons.usu.edu/govdocs/368

[31] Agreement to Implement, U.S. District Court Order, Dated May 25, 2006. Herein after Agreement to Implement. http://deq.idaho.gov/media/550373-implementation_agreement_2008.pdf

contained in the WILD Database and accompanying maps represents a substantially accurate estimate of the extent of Targeted Waste in the SDA." [Pg.3]

"IV. AGREEMENT TO RETRIEVE TARGETED WASTE
"Based upon the facts and conclusions set forth above in Sections II.F-L the Parties agree that in determining compliance with Paragraph B.1 of the 1995 Settlement Agreement and the Court's May 25, 2006 Memorandum Order, with respect to Transuranic Waste located in the Subsurface Disposal Area, removal of the following waste streams (Targeted Waste) in accordance with Section V satisfies removal of Transuranic Waste from the Subsurface Disposal Area:

A. 741 Sludge
B. 742 Sludge
C. 743 Sludge
D. Graphite Waste
E. Filters/pre-filters
F. Uranium Oxide (DOE and Idaho recognize that Uranium Oxide is not a Transuranic Waste within the definition of the 1995 Settlement Agreement. Notwithstanding that, the Parties agree that removal of Uranium Oxide co-located with other Targeted Wastes is environmentally beneficial and thus have included it as a Targeted Waste.)
G. Other waste streams mutually agreed by the Parties, as the result of operational experience or process knowledge, to routinely be recognizable as Transuranic Waste.

"V. TRANSURANIC RETRIEVAL VOLUME
A. <u>DOE shall retrieve not less than 6,238 cubic meters of Targeted Waste</u> from within that portion of the Subsurface Disposal Area identified in Appendix D attached hereto or areas immediately adjacent to those areas within retrieval enclosures constructed pursuant to this Agreement." [32] [emphasis added] [Pg.6]

This above "Agreement to Implement" states it's an "interpretation" of original 1995 Settlement Agreement actually is a "bait-and-switch" very similar to how DOE got around dealing with 900,000 of INL/INTEC previously classified high-level liquid waste by unilaterally reclassifying it as mixed hazardous transuranic (MTRU) sodium-bearing/MLL TRU waste [33] and redefining transuranic waste from >10 nCi/g to >100 nCi/g. These policy actions are only to save money for legacy waste cleanup. Another example is NRC/EPA's changing the maximum contaminate level (MCL) for tritium from 10,000 to 20,000 pCi/L. DOE has the full weight of the federal Department of Justice behind it, so its ability to take these types of unilateral policy actions to cover-up environmental reactor releases is easier - especially in ill-informed small economically limited states like Idaho.

This new 2008 Agreement to Implement only requires DOE to "exhume not less than 6,238 cm" (<10% of 65,000 cm) stipulated in the 1995 Settlement Agreement from the RWMC/SDA in a grossly limited "Accelerated Retrieval Project." [34] See Section IX discussion below.

It all comes back to the validity of the original 1995 Settlement Agreement Consent Order and further Federal Court Judge Lodge's re-interpretation about what the removing "all TRU waste" and *alpha* LLW from INL means. Judge Lodge states: "The parties specifically define transuranic waste without any

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[32] AGREEMENT TO IMPLEMENT U.S. DISTRICT COURT ORDER DATED MAY 25, 2006

[33] DOE unilaterally reclassified 900,000 gal. sodium-bearing liquid waste in INL/INTEC underground tanks from high-level as identified in Idaho High-Level Waste & Facility Disposition Final Environmental Impact Statement, 2002, (DOE/EIS-0287) to mixed low-level waste. EDI joined NRDC in a suit challenging this action. See: Civ. No. 01-0413-S-BLW.

[34] Idaho INL Oversight Program states: "Requires shipment of all retrieved transuranic waste and at least 7,485 cubic meters of targeted waste out of Idaho." *2008 Agreement to Implement U.S. District Court Order dated May 25, 2006 Oversight Program* website. http://www.deq.idaho.gov/media/

limitations as to its location within INEEL nor any limitations as to amount." [35] Because the general public is not aware of what the changes to the INL cleanup program are between the 1995 and the 2008 "Agreements" between Idaho and DOE, this report dedicates considerable space below to explaining them.

DOE has for decades been able to maneuver around Idaho Department of Environmental Quality (IDEQ) and EPA as regulators using its federal sovereign immunity power over small states. "DOE specifically reserves the rights, authority, claims, or defenses, including sovereign immunity that it may have regarding state jurisdiction over wastes designated for disposal at WIPP." [36] [emphasis added] Also DOE carves out another waste catch (cited above) with: "DOE has either: (1) certified the waste for disposal at WIPP, or (2) declared that the waste will be managed as MLLW or LLW." [37] In other words, DOE reserves the right to unilaterally reclassify TRU and alpha LL waste and leave it buried.

Former Governors' Andrus and Batt were the first to exercise the requisite political leadership and take a stand in opposition to DOE/INL abuse of our state. It's a possibility DOE sold current Governor Otter who signed the 2008 "Agreement to Implement" that radically changes major components to the earlier 1995 Settlement Agreement by convincing him INL wanted to get started with SDA cleanup and that it would not be the final CERCLA action. [38] We need to know the answer to this question. According to DOE's report on the question of "final" RWMC cleanup it states: "OU 7-13/14, the comprehensive remedial investigation and feasibility study for the RWMC/SDA, is the final operable unit planned under CERCLA and implemented under the Federal Facility Agreement and Consent Order for Waste Area Group 7." [39] [emphasis added]

Philip E. Batt wrote the following concerning INL radioactive waste in the Idaho Statesman, "Former Gov. Batt: Don't bring Washington state nuclear waste to Idaho," June 15, 2018 that states:

> "When I had the privilege of serving as Idaho's governor in the late 1990s, storing nuclear waste in Idaho was a big topic. The Idaho National Laboratory at Idaho Falls had served as a dumping ground for undesirable materials, including those containing passive and active nuclear waste, with little thought of what would happen to those materials during a safe, final disposition of them.
>
> "Former Idaho Sens. Frank Church and Jim McClure were among Idaho politicians and concerned citizens who tried their best to stabilize the INL and put that unique facility to a better, safer use. But Gov. Cecil Andrus was the most determined to change the role of INL. In his final days in office, he blocked spent Navy fuel rods from coming to our facility. My friend Cecil then went to a much-deserved retirement and left the problem to me. I was damned if I would let the shipment in and was faced with a losing lawsuit by blocking these shipments. Our U.S. Navy said that their submarines and other ships would be stranded at sea and sailors would not be allowed to come home for their accumulated leaves or vacations.
>
> "The Navy proclaimed that a national emergency existed as long as Idaho blocked spent rods from coming to INL. Idaho would certainly lose our case in court. My only alternative was to try to renew a negotiated settlement with the U.S. government. Sen. McClure, Assistant Attorney General Clive Strong and others carried the ball for me. Cecil Andrus was reluctant to be involved, but he played an important role in reaching the settlement.
>
> "At the time I was quite unpopular. A recall to remove me from office had a lot of support. After my agreement was put together, there was a public vote to approve it or reject it. Actor Bruce Willis led the opposition and vowed to put me in as a clerk in a 7-Eleven store.

[35] Federal Court Judge Lodge citation in State of Idaho Oversight Monitor September 2004, Pg. 4.
[36] Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Revision 6A, Pg. 5-7.
[37] INL-STP, Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Revision 6A, Pg. 5-6
[38] ICP-EXT-05-00784 "OU 7-13/14, the comprehensive remedial investigation and feasibility study for the RWMC, is the final operable unit planned under CERCLA and implemented under the Federal Facility Agreement and Consent Order for Waste Area Group 7, Pg. iii. [emphasis added]
[39] ICP-EXT-05-00784, pg. iii

> "But neither side wanted any more waste to come into Idaho. My agreement called for cleaning up everything possible at the site and shipping all transuranic waste — the long-lived nuclear waste — to a secure facility in New Mexico. Attorney General Lawrence Wasden has insisted on strict compliance to the contract. Our personnel at INL have done a fantastic job of carrying out the agreement. We are behind on two projects — putting our high-level liquid waste into a solid, permanent form and finishing shipment of transuranic waste to New Mexico. There was an accident in the New Mexico storage facility, which is being repaired, and our shipments are ready and will be resumed.
>
> "After cleaning up everything being stored above our Snake River Aquifer, it is ironic that our U.S. government now wants to send Hanford, Wash., transuranic waste to Idaho in order to prepare it for shipment to New Mexico. Come on, Hanford. Prepare your own transuranic waste and send it to New Mexico. We did ours." [40]

DOE has consistently missed cleanup milestones which were the primary driver for Governors' Andrus and Batt to initiate Federal Court Consent Order to force compliance. We will list these missed milestones later. SDA Active Low-level Waste Disposal Facility (Pits 17 to 20) will continue to receive waste through 2020 despite the fact that it does not qualify under EPA regulations as a city dump. The legal frame work is:

> "Ultimately, the entire SDA (including the [Active Low-level Waste disposal Facility]ALLWDF) will be closed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.), in accordance with the Record of Decision (ROD) for the RWMC Operable Unit (OU) 7-13/14 (DOE-ID 2008b). Until final closure occurs, <u>DOE is responsible for self-regulation of the ALLWDF</u>, in accordance with the Atomic Energy Act (42 USC § 2011 et seq.) and management requirements within DOE O 435.1 Chg. 1, for ongoing waste disposal operations through final closure, including interim closure procedures." [41] [emphasis added]

As discussed above, this new 2008 "Agreement to Implement" is a radical change that is significantly less than the 1995 "Settlement Agreement" stipulating removal of "**all transuranic waste** now located at INL currently estimated at 65,000 cm in volume to WIPP." [pg.2] This TRU waste estimate was as at the time, a gross underestimate. [42] Additionally, the WMPEIS and the 1995 Agreement stipulate that: "DOE shall, as soon as practicable, commence the procurement of a treatment facility ("Facility") at INEL for the treatment of mixed waste, transuranic waste and alpha-emitting mixed low-level waste." [43] [emphasis added]

The Accelerated Retrieval Project retrieval will only remove roughly retrieves 6,238 cubic meters when finished or less than 10% of the buried TRU waste and none of the alpha-emitting mixed low-level waste. The 1995 Settlement Agreement says in Section E.2. "treat the alpha-emitting mixed low-level waste." Treatment means it comes under EPA Land Disposal Regulations as a "new" waste and therefore must be disposed in a Subtitle C hazardous/radioactive waste facility that SDA does not qualify for. This issue is discussed more in section IX below. "In many cases, cleanup "success" depends on what is done with contaminated soil. Some may be appropriate for the new on-site landfill for cleanup materials." [44] See Section IX below for detailed discussion on EPA Land Disposal Regulations on the issue of "new" waste whenever a RCRA remediation action occurs requiring all listed hazardous/radioactive material exists irrespective of it's being "targeted."

The 1995 Settlement Agreement in the above removal and treatment definition is: "Treat" shall be defined,

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[40] Philip E. Batt, Idaho Statesman, "Former Gov. Batt: Don't bring Washington state nuclear waste to Idaho," June 15, 2018. https://www.idahostatesman.com/opinion/readers-opinion/article213245179.html

[41] RPT-1267, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267.

[42] Chuck Broscious, August 25, 1993 Motion to Intervene (Amicus Brief) in support of Governor Andrus.

[43] DOE-EIS-0200-F, WPEIS Transuranic Waste Alternatives Table shows S = storage after treatment for one year, prior to transportation for disposal, for all alternatives except No Action that was not the preferred alternative. [8-20 Vol I]

[44] Idaho INEEL Oversight Program, Monitor, July 2002.

as applied to a waste or spent fuel, as any method, technique, or process designed to change the physical or chemical character of the waste or fuel to render it less hazardous; safer to transport, store, dispose of; or reduce in volume." Also in Section C "Spent Fuel and High-Level Waste Shipments Leaving Idaho" also states: "1. DOE shall remove all spent fuel, including naval spent fuel and Three Mile Island spent fuel from Idaho by January 1, 2035." This is an issue for SDA remediation because used spent fuel is found there.

The 1993 INL EIS Restoration Program Assessment Table 4.7-5 shows high-level irradiated reactor fuel (SNF) in SDA in Trenches (25, 27, 28, 30, 31, 33, 35, 40, 41, 42, 43, 46, 52, and 54) and enriched uranium dumped in Trench No. 49. [45] See Attachment A to this report for details.

This SNF dates back to pre-1977 nuclear waste dumping practices that allowed DOE to bury every type of waste in the SDA including irradiated reactor fuel and the whole reactors. INL built/tested 52 reactors that eventually ended up in the SDA. DOE has denied that high-level (irradiated reactor fuel) waste was dumped in the SDA despite EDI's repeated efforts to raise the issue and it is of no particular focus for the "targeted waste." Governor Otters' 2008 Agreement to Implement reinforces DOE requirement to protect national by stating:

> [T]the Parties used historic disposal records generated by DOE to identify areas within the SDA where retrieval is, based upon current knowledge and technological capabilities, appropriate in light of countervailing considerations of worker safety and national security.

In fact Idaho Governor Otter reinforced this secrecy in the "Agreement to Implement" goes further by stating that waste retrieval operations must be suspended when it "implicates national security issues involving classified information, such factors constituting the exclusive basis upon which DOE may request the suspension of a retrieval obligation under this Agreement." [46] These issues are discussed in Section III below. DOE/INL have always denied that high-level (irradiated reactor fuel) waste and the remains of the 52 reactors built/tested at INL, were dumped in the SDA and it is of no focus for the "targeted waste retrieval" cleanup program.

Tami Thatcher's "Idaho To Miss Important Idaho Settlement Agreement Milestones" [47] reports:

> "The currently missed milestones are the slowed pace of shipments of transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico, which resumed a year ago, and the failure to get the Integrated Waste Treatment Unit (IWTU) treating liquid radioactive waste it was supposed to have completed in 2012. [48] DOE is paying fines to the state for not emptying the waste tanks and calcine treatment is delayed by continued problems at the IWTU. [49] [50] [51] [52] [53] [54] [55] [56]

[45] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment May 14, 1993, Pg. 4.7-9

[46] Idaho and Department of Energy Agreement to Implement, pg. 8, 2006.

[47] Tami Thatcher, Idaho To Miss Important Idaho Settlement Agreement Milestones Environmental Defense Institute, News on Environmental Health and Safety Issues June 2018, Volume 29, Number 6.

[48] Bryan Clark, *The Idaho Falls Post Register*, "IWTU might begin this year – DOE gives progress report to LINE Commission," February 1, 2018. The Post Register reported that as of last June, the IWTU was more than $200 million over budget. The DOE faces daily fines while it's not in operation because of missing the 2012 milestones and subsequently missed renegotiated schedules for hazardous waste tanks regulated by the State of Idaho.

[49] In order to ship the calcine out of Idaho, it needs a repository to ship to. It needs to be packaged into canisters for shipping and disposal. Calcine retrieval must be performed regardless of the choice of repository or choice of canister packaging method such as Hot Isostatic Press (HIP) (see our June 2017 newsletter). The Department of Energy had formally announced in 2009 the decision to use HIP as the method of repackaging the calcine for shipping and disposal. The 2009 decision was actually amending previous decisions. Now it appears that the 2009 decision may be changed again because the Department of Energy recently issued a report by an independent review panel describing the possible treatment options for the calcine.

"Even with the progress of shipping of above-ground stored transuranic waste and some buried transuranic waste, the "cleanup" will still leave plenty of transuranic waste over Idaho's aquifer. The americium-241 buried at the RWMC not being exhumed would require six Snake River Plain aquifers to dilute to drinking water standards." [57] [58] [59] [60] [61]

Both the CAB and DOE-ID both agree in 2017 that calcine retrieval needed to continue uninterrupted. Environmental Defense Institute has previously submitted comments to the Idaho Department of Environmental Quality about the calcine. More background on the calcine can be found in the July 2017 EDI newsletter and in other reports listed.

Sec. Moniz: "At the Idaho National Laboratory, 4,400 cubic meters of calcine high-level waste, which exists as granular and powdered solids, is currently planned for treatment, but may be more safely and efficiently packaged without treatment and disposed in a borehole or in a defense waste repository. The same is true for granular solids resulting from fluidized bed stream reforming of 900,000 gallons of sodium-bearing liquid wastes that will be treated at the Idaho site." DOE has suspended its two repository approach and its borehole research.

[50] Department of Energy Press Release, Amended Record of Decision: Idaho high-Level Waste Facilities Disposition Final Environmental Impact Statement REVISED BY STATE 12/21/09. http://www.id.doe.gov/NEWS/PressReleases/PR100104-HIP/Calcine%20ROD%20final_SIGNED_PDF.pdf
In 2009 DOE had decided to select hot isostatic pressing (HIP) to treat the calcine.

[51] US DOE-EM, "Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory, Volume 1 – Summary Report," April 2 2016. https://energy.gov/sites/prod/files/2016/05/f31/Volume%201%20Calcine%20AoA%20Final%2004-19-16%20w_signatures.pdf

[52] See the Idaho National Laboratory Citizens Advisory Board meeting presentations for June 22, 2017, for the Idaho Cleanup Project at www.inlcab.energy.gov

[53] Chuck Broscious and David B. McCoy, "Preliminary Comments on Calcined Solids Storage Facility," Submitted to Idaho Department of Environmental Quality, May 9, 2017. http://www.environmental-defense-institute.org/publications/EDI-CSSF-Permit-S.pdf and pictures at http://www.environmental-defense-institute.org/publications/EDI-CSSF-Attach.pdf

[54] Calcined Solids Storage Comment Submittal (Docket No. 10W-1604), by Chuck Broscious and Tami Thatcher, July 11, 2016. http://www.environmental-defense-institute.org/publications/EDICalcineComments.pdf

[55] J. V. Crum and J. D. Vienna, Pacific Northwest National Laboratory and D. K. Peeler and I. A. Reamer, Savannah River Technology Center, for the US Department of Energy, "Formulation Effects for Direct Vitrification of INEEL Blend Calcine Waste Simulate: Fiscal year 2000. http://www.pnl.gov/main/publications/external/technical_reports/PNNL-13483.pdf

[56] http://energy.gov/articles/secretary-monizs-remarks-look-back-blue-ribbon-commission-america-s-nuclear-future

[57] See the CERCLA administrative record at www.ar.icp.doe.gov (previously at ar.inel.gov) and see also Parsons, Alva M., James M. McCarthy, M. Kay Adler Flitton, Renee Y. Bowser, and Dale A. Cresap, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267, 2014, Idaho Cleanup Project. And see Prepared for Department of Energy Idaho Operations Office, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, DOE/ID-11396, Revision 3, October 2014 https://ar.inl.gov/images/pdf/201411/2014110300960BRU.pdf

[58] An often repeated contrived excuse for limiting RWMC cleanup comes from the Record of Decision fuzzy artwork of "worker" risk per acre of waste dug up. It references administrative record report RPT-188 at ar.inel.gov. or ar.icp.doe.gov. It is used to defend digging around in only about 6 acres and not the entire 35 acres of buried waste at RWMC. Radiation worker risks are higher than DOE acknowledges, but they claim that radiation protections for DOE contractor radiation workers limit health risks. But the case was not actually based on a monitored radiation worker. It was based on an unmonitored state employee who receives an unmonitored 47 rem dose throughout his career if the cleanup extends from 6 years to 25 years. This argument, however, is immediately forgotten when discussing extending operations at the AMWTP to outside waste. There is no estimate of the number of people who will be dosed from the polluted aquifer. The gross conservatism of this unmonitored "worker" dose estimate was used to argue that cleaning up the entire mess would yield incrementally high worker doses for each additional acre cleaned up.

[59] DOE/EA-1793US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA-1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf

[60] DOE/NE-ID-11244, U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory and Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the INL Site. DOE/NE-ID-

III. Buried Mixed Hazardous Radioactive Waste Threat to the Environment

This EDI report primarily focuses on both the existing buried mixed RCRA listed hazardous, TRU, low-level alpha and the new radioactive TRU waste DOE wants to import listed above in Table 1 above to the RWMC. Buried radioactive waste issues as a whole at INL is politically intrinsically interrelated because of the continuing contaminate migration of this waste into Idaho's sole source aquifer underlying this waste dump. This contamination has an enormous environmental impact that will last for millennia and the general public is not getting an accurate picture of how current policy decisions will impact their and future generations lives.

The DOE own waste characterization of risk posed by RWMC/SDA shows:

> "Based on existing site characterization and risk information, [Nuclear Energy] NE-ID concluded that source materials located within Pit 4 and Pit 6 contain hazardous substances that have been released to the surrounding environment, and that the release of source materials may continue without remedial action. Further, NE-ID concludes that the proposed NTCRA is consistent with relevant National Contingency Plan criteria (40 CFR 300.4 15[b][2][iii]) considering that the area of focus contains hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release (40 CFR 300). If no action were taken (i.e., absent institutional controls or other remedial action), existing OU 7-13/14 risk documentation indicates there may be a potential future threat to the environment from release of hazardous substances previously disposed of in Pit 4." [62]

EDI submitted extensive comments on the INL 5-Year CERCLA Cleanup Review that includes numerous issue areas where DOE has never and does not intend to live up to its legal commitments to appropriately remediate its long history of radioactive and hazardous waste mismanagement. [63] [64]

> "The storage of any form of hazardous waste is prohibited unless the waste has available treatment to meet land disposal restriction (LDR) requirements in accordance with 40 CFR 268 of the Resource Conservation and Recovery Act (RCRA). In 1992, Congress passed the Federal Facility Compliance Act (FFCA), which allows for the storage of radioactive and hazardous mixed waste (mixed waste) until available treatment can be developed that meets the LDR requirements. Transuranic-contaminated mixed (TRU) waste is covered under the FFCA through the Site Treatment Plan (STP) since the implementation of the plan in November, 1995. [Abstract]

11243. INL. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of EDI's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

[61] INL/EXT-10-19168, Idaho National Laboratory, "Explanation of Significant Differences Between Models Used to Assess Groundwater Impacts for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste and Greater-Than-Class-C-Like Waste Environmental Impact Statement (DOE/EIS-0375D) and the Environmental Assessment for the INL Remote-Handled Low-Level Waste Disposal Project (INL/EXT-10-19168)," INL/EXT-11-23102, August 2011. http://www.inl.gov/technicalpublications/documents/5144355.pdf and a report prepared for the US Department Of Energy, ID Operations Office, "Preliminary Review of Models, Assumptions, and Key Data Used in Performance Assessments and Composite Analysis at the Idaho National Laboratory," INL/EXT-09-16417, July 2009. See p. 11, Tables 3 and 4 for sorption coefficients.

[62] INEEL CERCLA Administrative Record, SUBJECT: Approval to Proceed with Preparation of an Engineering Evaluation/Cost Analysis for the Idaho National Engineering and Environmental Laboratory, Accelerated Retrieval Project Phase II in the Subsurface Disposal Area (EM-WM-04-083), 2nd Addendum OU 7.

[63] Chuck Broscious, What is Buried at Idaho National Laboratory's Radioactive Waste Management Complex Subsurface Disposal Area, Five Year Review, Waste Area Group (WAG) 7 CERCLA Cleanup Idaho National Laboratory for U. S. Department of Energy March 2016. http://environmental-defense-institute.org/publications/EDICERCLARWMCRevG.pdf

[64] Tami Thatcher's "Important Long-Lived Contaminants at INL's RWMC Not Remediated." EDI special report. http://environmental-defense-institute.org/publications/RWMCunrem.pdf

"DOE's position is that the FFCA and STP's only regulate treatment (not transportation and disposal) of wastes; that the DOE has authority to determine how to "designate" wastes destined for WIPP; and that the State and DOE agreed in the STP itself which wastes were "designated" to go to WIPP. In addition, the TRU waste in question is already subject to enforceable schedules under a court order (the Idaho Settlement Agreement), and transportation of this waste to WIPP is a top priority of the DOE. Other sites (e.g., SR) have agreed to include unenforceable schedules in the site's STP for wastes designated to go to WIPP.

"The State concurred that wastes properly designated for disposal at WIPP were not subject to the LDR requirements but did not concur that all mixed TRU waste currently located at the INEEL had been properly "designated" within the meaning of the Amendment Act. The State also disagreed that these wastes are exempt from the enforceable section of the STP and requested DOE-ID to comply with the appropriate sections of the STP. [Pg.1&2]

"The Federal Facilities Compliance Act (FFCA) required all DOE facilities managing mixed waste to develop Site Treatment Plans (STP) to address mixed waste that is subject to Land Disposal Restrictions (LDR) standards promulgated pursuant to RCRA Section 3004 (m). In 1996 the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Amendment Act states that "transuranic mixed waste designated by the Secretary [of Energy] for disposal at WIPP…. is exempt from treatment standards promulgated pursuant to section 3004 (m) of [RCRA]". Therefore, DOE position is that Transuranic mixed waste destined for WIPP is not subject to, or requires inclusion in, the provisions of the STP.

"DOE's position as stated before, the FFCA required all mixed waste subject to LDR's and that required storage for longer than one-year be included in the STP. DOE position is that changes in the law provide that wastes designated for disposal at the WIPP are <u>not subject</u> to the LDR. Therefore such wastes should be deleted from the STP.

"This position is based in the change in the law brought about by the 1996 WIPP Withdrawal Amendment Act, Section 3100 of Public Law. Originally, section 9 of the 1992 WIPP Withdrawal Act had provided that activities at WIPP would fully comply with hazardous waste and other environmental laws. The Amendment Act revised section 9 to specify that "transuranic mixed waste designated by the Secretary [of Energy] for disposal at WIPP" is exempt from LDR requirements. Because such wastes are no longer considered to be prohibited wastes under the law, they are no longer subject to the requirements of the STP.

"STATE OF IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) POSITION
While DEQ concurred that waste properly designated for disposal at WIPP are not subject to the LDR restrictions of RCRA, DEQ did not concur that all mixed TRU waste currently located at the INEEL was properly designated within the meaning of the WIPP Withdrawal Act. DEQ also did not agree that such wastes are exempt from the STP of the enforceable schedules found in the STP. Instead DEQ believed that the STP must be complied with until such time as the wastes have been shipped to WIPP.

"DEQ interpret the amendments to the WIPP Withdrawal Act to require that a waste acceptance determination is made prior to being removed from the STP. Wastes destined for disposal at WIPP must be designated as such by the STP and information related to interim storage and transport to WIPP is provided. For wastes that have not yet been identified in the STP as going to WIPP, these wastes must stay in the relevant portion of the STP, even if they may eventually be so designated. Finally, DEQ requested that before removal from the enforceable STP schedules, all wastes listed in the STP as TRU waste must be shown to meet the Waste Acceptance Criteria (WAC) at WIPP. This would satisfy DEQ that these wastes would indeed be accepted at WIPP. [Pg.2]

"At this time there are two positions, out of three, on the table being discussed. These positions are: 1) That all TRU waste stored at the INEEL be removed from the INEEL STP since the waste is "designated" for disposal at WIPP, 2) That all TRU waste streams remain in the INEEL STP, but in a new section of the STP which has no enforceable milestones, and 3) That only the TRU waste streams that meet the WIPP WAC will exit the INEEL STP. Positions 1 & 2 above are both acceptable to DOE, but position 3 is <u>not</u> because of the potential for enforceable milestones being applied to TRU waste before it is evaluated against the WIPP WAC or treated to meet the WIPP WAC.

"Expiration of three-year delay in effective date of waiver of sovereign immunity for RCRA 3004(j) violations may not affect DOE facilities currently storing mixed waste. Under RCRA 3021(b), DOE was required to submit either to EPA or to state regulatory officials a site treatment plan for developing mixed waste treatment capacity and technologies. As of January 1997, all of the treatment plans for the 35 DOE sites storing mixed waste had been approved by the appropriate regulators.

"A change in the law did not sufficiently explain all potential regulatory interpretations to adequately address all issues that have arisen. DEQ and DOE find themselves in such a legal ambiguity with a uncertain resolution with in any linear timeframe. The potential for this issue to be taken to court is doubtful. Unless a solution is reached in January, 2002 it is very likely that public involvement may occur. On the bright side, DOE-ID continues to ship TRU waste to WIPP from

> the INEEL. As the volume of waste in storage at the INEEL continues to decrease, the likelihood of this issue maintain significant diminishes.” [65]

It is an important issue from both a regulatory and cleanup/treatment perspective that INL’s buried and stored TRU waste covered in the Site Treatment Plan continues to conflict with the 1995 Settlement Agreement and IDEQ even though DOE claims otherwise.

> “DOE asserts that the waste covered by this section was “designated for disposal at WIPP” when the STP was effective on November 1, 1995, and became exempt from the requirements of this STP and the Federal Facility Compliance Act by virtue of Section 3188 of the WIPP Land Withdrawal Amendments Act of 1996 (P.L. 104-201, 110 Stat. 2422). DEQ does not concur. As provided in Section 5.4 of the Consent Order incorporating this STP, DOE specifically reserves the rights, authority, claims, or defenses, including sovereign immunity that it may have regarding state jurisdiction over wastes designated for disposal at WIPP. Notwithstanding this reservation, DOE agrees the milestones set forth in this STP for processing transuranic contaminated wastes are enforceable under this STP and Consent Order.”
>
> “MTRU [mixed transuranic] and α-MLLW waste will be processed by the end of 1Q FY 2019 as follows:
>
> “1. Commencing in FY 2006, DOE agrees to process a cumulative average of 4,500 cubic meters of original volume of TRU-contaminated waste per year (waste listed in Table 4-2) through the AMWTP or other facility as follows:
>
> “DOE may count the waste as processed toward the annual 4,500 cubic meters requirement once DOE has either: (1) certified the waste for disposal at WIPP, or (2) declared that the waste will be managed as MLLW or LLW.
>
> “When the total volume of a mixed waste stream managed by the RWDP or a waste category (i.e., debris, sludge, or soil) for a mixed waste stream managed by the AMWTP in Table 4-2 has been certified for disposal at WIPP, it may be deleted from the STP under Section 2.7.1, “Deletion of Waste Streams.” When deleted, the waste stream will be included in Table 4-6, “Deleted Waste Streams.” [RWDP= Remote-Handled Waste Disposition Project]
>
> “DOE shall declare that specific mixed waste will be managed as MLLW by adding it to Table 4-1, “Mixed Low-Level Waste Streams Requiring Treatment” and submitting the table along with other pertinent information at the quarterly meetings or in writing prior to such meetings. Only waste identified in such written submissions to DEQ shall be considered MLLW and counted toward meeting the requirements for processing waste under this section.
>
> “2. The term “cumulative average” as used in this section means the amount of waste required to be processed annually (4,500 cubic meters) multiplied by the number of years starting in FY 2006. For example, by FY 2010, DOE must have processed 22,500 cubic meters of original volume of TRU-contaminated waste (5 years times 4,500 cubic meters). The amount of waste processed in any year in excess of the required amount may be applied toward the cumulative average in subsequent years.
>
> “3. The term “original volume,” as used in this section, means the waste volume prior to processing that was stored as TRU at the time the Idaho Settlement Agreement and Consent Order were signed and approved by the court on October 17, 1995.
>
> “Nothing in this STP affects or modifies the obligations and remedies in the October 17, 1995, Settlement Agreement. The INL facilities to treat MTRU contaminated waste include the RWDP (at CPP- 659 and CPP-666), AMWTP, and the ARP V Repackaging Facility.” [66] [emphasis added]

The above INL Site Treatment Plan significantly fails to show the actual the TRU waste inventory. According to 1991 Idaho Department of Health and Welfare, the following is INL/RWMC inventory summary of buried TRU, stored TRU (CH and RH) on pads above ground as of 1991:

Buried Transuranic	56,630 cubic meters
Stored Transuranic - Contact handled	64,750 cubic meters
Stored Transuranic - Remote handled	77 cubic meters [67]

[65] Monte Davis, Bechtel BWXT Idaho, LLC, et.al., TRU Management in Site Treatment Plan at INEEL,WM’02 Conference, February 24-28, 2002, Tucson, AZ.

[66] INL-STP, Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Revision 6A, Pg. 5-6

[67] Idaho Department of Health and Welfare INL Oversight Program, "*Wastes at the INL*," 1991.

DOE's own 1991 report *U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics* show TRU + low-level Alpha (included in the 1995 Settlement agreement) in the following RWMC/SDA inventory:

*Solid Transuranic + Low-Level Alpha	85,000 cubic meters containing 647,000 curies
Buried Transuranic	57,000 cubic meters
Stored Transuranic	64,757 cubic meters
Contaminated Soil	690,000 cubic meters
Mixed Low-Level	25,879 cubic meters [68]

* Alpha Low-Level Waste: Waste that was previously classified as transuranic waste but has a transuranic concentration lower than the currently established limit for transuranic waste. Alpha low-level waste requires additional controls and special handling (relative to low-level waste). This waste stream cannot be accepted for onsite disposal under the current waste acceptance criteria; therefore, it is special-case waste. Alpha Low-Level Waste [αLLW] refers to previously disposed of radioactive wastes having a concentration of TRU radionuclides between 10 and 100 nCi/g. They may include some wastes that contain hazardous constituents regulated under RCRA, NRC and TSCA, i.e., mixed waste Land Disposal Regulations. (See Section IX below)

According to DOE's June 2017 Idaho Site Cleanup By the Numbers

"65,000 cubic meters of <u>stored</u> transuranic waste retrieved - 50,000 meters of it from under a above ground soil berm inside a building large enough to house an aircraft carrier.

" 8,200 cubic meters of buried transuranic waste retrieved and readied for shipment to WIPP.

"53,000 cubic meters of transuranic waste have been shipped to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico.

" 260 shipments of remote handled transuranic waste have been shipped off-site for permanent disposal." [69] (volume is not stated so no accountability on mass volumes)

Summary of Stored and Buried Transuranic Waste Status at RWMC Comparing Inventories

TRU Solid Waste	IDH&W 1991 Inventory *	DOE 1991 Inventory * Included LL-Alpha	Idaho Cleanup Inventory * June 2017	Shipped to WIPP June 2017 *
Stored (Surface) Contact Handled Remote Handled	 64,750 77	64,757	65,000	 260 shipments volume not stated
Totals	64,827	64,757	65,000	53,000
Buried	56,630	57,000	8,200	
Totals Stored/buried	121,457	122, 757	73,200	53,000
Contaminated Soil #			690,000	0
Pad A (Surface Pad Left in Place)	10,200	10,200		0

* Above table Inventory in cubic meters (cm); # In many cases, cleanup "success" depends on what is done with contaminated soil. Some may be appropriate for disposal the new Idaho CERCLA Facility on-site landfill for cleanup materials.

[68] DOE/RW-006(a); U.S. Department of Energy Integrated Data Base for 1991, Revision 7, October 1991, U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics, pg. 85 Table 3.5, Oak Ridge National Laboratory.

[69] https://www.energy.gov/em/idaho-national-laboratory

There were about 57,000 cubic meters of TRU buried in the SDA and DOE has exhumed only a tiny fraction (~10%) of that, 6,238 cubic meters, is a point this review must emphasize. As previously noted, this (~10%) is a violation of the 1995 Settlement Agreement and the various EIS/PEISs that endorsed the 1995 Consent Order.

Selected Rocky Flats TRU Waste Dumped at the Subsurface Disposal Area, 1954-1972 [70]

Radionuclide *	Lower Bound Estimate	Upper Bound Estimate
Plutonium (all species)	1,102 kilograms	1,455 kilograms
Americium-241	44 kilograms	58 kilograms
Uranium-235	386 kilograms	603 kilograms

[ER-BWP-82 @A-4]

EDI's analysis of the Rocky Flats plutonium (TRU all species) dumped at the RWMC during the years 1952 – 1983 has a curie content of 576,967 Ci, and is also understated because only individual listings of >9 curies were counted. [71] [72] INEL-95/0310, Volume 1,Table S-2 Pu 238, 239, 240, 241 and 242 totals "Lower bound" 347,430 ci; "Upper Bound" 659,601 ci. [73] Anyone who tracks DOE's documents finds a variety of findings on how much of anything is anywhere. EDI has found that generally the accounting in earlier administrations (like Bill Clinton who appointed Hazel O'Leary as head of DOE) tend to be more candid. It was O'Leary who released the first documentation on the US inventory of nuclear weapon material (and legacy waste) at the various DOE Complex sites as well as the first accounting on the human radiation experiments conducted in the US.

In 1988 EDI filed a Freedom of Information Act for all of INL operating history waste management documents that provided the basis for the subsequent Citizens Guide to INL. It was during this era that former Governor Andrus and Batt were able to get their 1995 Settlement Agreement signed that at the time was revolutionary. The health effects of these nuclear legacy waste must always be emphasized such as:

> "Radiological Exposure Hazards of Plutonium versus Depleted Uranium: Radiation exposures caused by inhalation of plutonium are 6.7 million times greater than equivalent exposures of depleted uranium—internal exposure of only 1 microgram of plutonium exceeds the allowable exposure limits established by DOE." [pg. 4-4] [74]

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[70] ER-BWP-82, Engineering Design File, Pit 9 Project, Revised Plutonium, Americium-241, and Uranium-235 Inventory estimates for Pit 9 Based on the 1993 Historical Data Task, Pg. A-4, EG&G Idaho Inc. ER-BWP-82.

[71] INEL-95/0310, A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste Buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983 Rev.1, Volume 3, August 1995. INEL-95/0310, (Formerly EGG-WM-1 0903). A companion report to this report, A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1984-2003, INEL-95/0135.

[72] Hull; Plutonium ES&H Vulnerability Assessment, Argonne National Laboratory, Tom Hull, DOE HQ, 1995.

[73] INEL-95/0310, Volume 1, Table S-2, Pg. xxx, August 1995, (Formerly EGG-WM-1 0903).

[74] Waste Area Group 7 Analysis of OU 7-10 Stage II Modifications, Figure 4.1-2, Pg. 4-4

> "The radioactive nuclides in transuranic waste emit alpha radiation, which requires minimal shielding when outside the body but can severely damage human tissue if taken into the body by inhalation, ingestion, or other means (such as through cuts). Transuranic waste requires long-term isolation from the environment. It is produced during reactor fuel assembly, research and development, nuclear weapons production, and spent nuclear fuel reprocessing. Transuranic waste contains traces of plutonium, with lesser amounts of neptunium, americium, curium, and californium. [75]
> [Pg.7-79, DOE-EIS-0200-F]

Clearly, as the above inventories of transuranic TRU waste inventories show, the 1995 Settlement Agreement stipulating removal of "**all transuranic waste** now located at INL currently **estimated at 65,000** cm in volume to WIPP" was an underestimate. As previously stated DOE is not addressing the Section E-2 of the Settlement Agreement states: "DOE shall, as soon as practicable, commence the procurement of a treatment facility ("Facility") at INEL for the **treatment of mixed waste, transuranic waste and alpha-emitting mixed low-level waste"** for shipment out of Idaho. Former Governor Andrus understood the environmental impact all of these categories of waste was on the aquifer below the RWMC, thus his insistence on including all stipulated waste categories. It's now more than 35 years later and DOE continues to refuse to commit to real cleanup with no change in sight.

The whole RWMC of 96.8 acre and SDA with the 39 acre (pits/trenches/soil hole vaults) disposal area and new "Retrieval Area" is now reduced to only 5.65 acres based on DOE's "review of shipping and disposal records." The accuracy of these disposal records have been repeatedly shown to be grossly deficient especially during the earlier years when there was no attempt to segregate waste types; waste shipments were simply randomly/loosely dumped in whatever pit/trench was open at the time. [76]

The mixed hazardous RCRA waste in the SDA that DOE intends to leave buried is another crucial legal remediation issue we discuss more below. It must be emphasized that the SDA pits/trenches/soil vault holes are an unlined dump that would not even meet EPA standards for a Subtitle D garbage landfill, much less than a Subtitle C mixed hazardous low-level radioactive waste facility that requires full leachate capture liners with water extraction capacity to remove any leachate generated from the waste. See INL's CERCLA Disposal Facility just 9 miles up the road from RWMC/SDA that DOE refuses to use for buried waste. Under 40 CFR § 260.10

> "Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters." [Discussed more in Section IX below]

In 1950 when the Atomic Energy Commission created the National Reactor Testing Station (now called INL) hazardous and radioactive waste – without limitation of chemical/curie content - was randomly dumped in which ever pit (large items like reactors or tanks) or trenches for barrels. The photo below shows the pre-1970 dumping practices. After 1970 DOE created the classification of TRU waste (>10 mCi/g) that had to be stored above ground under soil shielding piles so it could be retrieved for final geologic burial.

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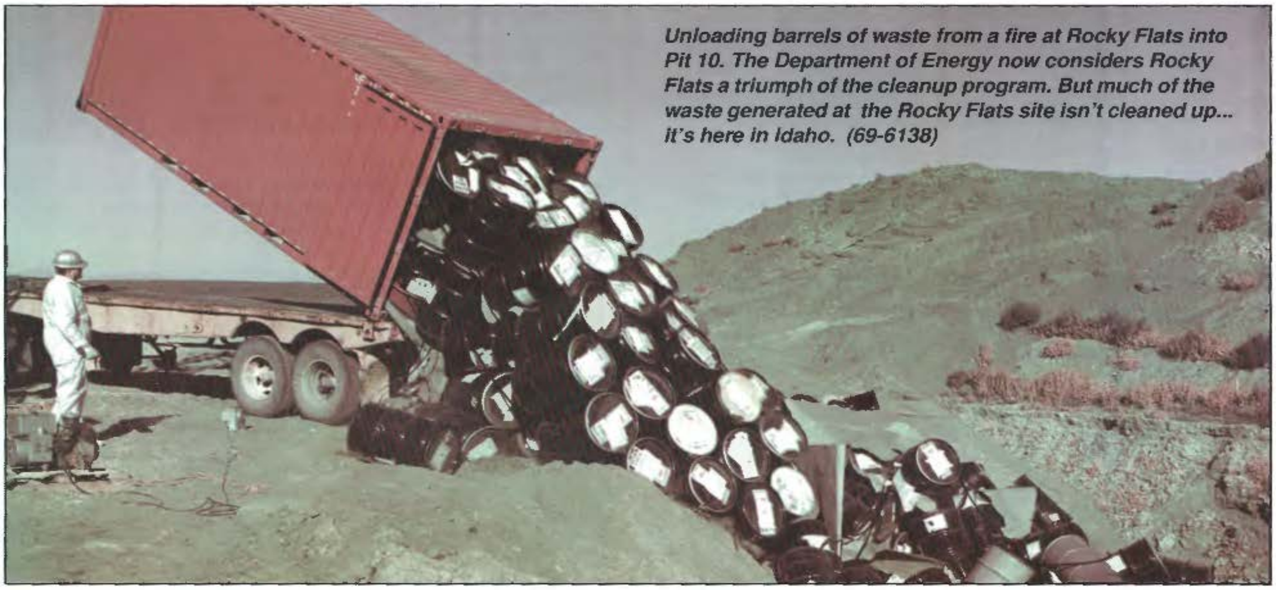
[75] DOE-EIS-0200-F, Final Waste Management Programmatic Environmental Impact Statement For Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste, Summary, May 1997, Pg.7-79.

[76] State of Idaho Oversight Program Monitor, 2006. This report also shows photos of DOE's practice of random dumping of waste barrels from a trailer truck into Pit # 10 at the RTWMC/SDA and stating 30,000 cm of TRU that must be exhumed and shipped to WIPP.



Unloading barrels of waste from a fire at Rocky Flats into Pit 10. The Department of Energy now considers Rocky Flats a triumph of the cleanup program. But much of the waste generated at the Rocky Flats site isn't cleaned up... it's here in Idaho. (69-6138)

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DOE's secrecy is not openly acknowledged and it intents to keep its previous/current operations literally and figuratively buried. But Governor Otter's 2008 "Agreement to Implement" goes further by stating that waste retrieval operations must be suspended when it "implicates national security issues involving classified information, such factors constituting the exclusive basis upon which DOE may request the suspension of a retrieval obligation under this Agreement." [77] [emphasis added]

The below reactor picture is one of many leftover from the Aircraft Nuclear Propulsion Program operated at the INL Test Area North. The project tried to develop a nuclear-powered airplane engine one is on display at INL/EBR-I and the rest dumped in SDA that are part of the 52 nuclear reactors built and operated at INL over its history. [78]

[77] Idaho and Department of Energy Agreement to Implement, pg. 8, 2006.

[78] Citizens Guide to INL offers a history of the site's Aircraft Nuclear Propulsion Program and a listing of the many reactors built, operated and emissions released. http://www.environmental-defense-institute.org/publications/GUIDE.963.pdf

Section IV. SDA Waste Contamination of Snake River Plain Aquifer

“The Snake River Plain Aquifer underlies RWMC at an approximate depth of 177 m (580 ft) and flows generally from northeast to southwest. The aquifer is bounded on the north and south by the edge of the Snake River Plain, on the west by surface discharge into the Snake River near Twin Falls, Idaho, and on the northeast by the Yellowstone basin. The aquifer consists of a series of water-saturated basalt layers and sediment.” [79] EDI offers the following background about National Academy of Sciences specific warnings about the choice of INL/RWMC as a nuclear waste dump in a semi-arid environment. The local USGS funded by AEC and DOE completely ignored these early warnings that state:

> “The movement of fluids through the vadose (aeration) zone and the consequent movement of the radioisotopes are not sufficiently understood to ensure safety.” “Five years later (1965) the National Academy of Sciences revisited NRTS [now called INL] and concluded that "1.) considerations of long-range safety are in some instances subordinated to regard for economy or operation, and 2.) that some disposal practices are conditioned on over-confidence in the capacity of the local environment to contain vast quantities of radionuclides for indefinite periods without danger to the biosphere." [80]
> [IDO-22056 @ 3] [emphasis added]

The hazardous waste in the SDA are listed RCRA contaminates that are not normally allowed to be dumped anywhere except in a permitted Subtitle C hazardous/radioactive waste facility. (See Section X below).

> “SDA contains high organic content waste that contains solvents (e.g., carbon tetrachloride, tetrachloroethylene, and trihreat [sic] waste. Carbon tetrachloride has been detected at levels slightly above its maximum contaminant level (MCL) in the aquifer. . [iii]
> “Monitoring and modeling indicate that carbon-14 and technetium-99 could threaten groundwater thresholds) beneath the SDA over the next 100 years. Carbon tetrachloride from solvents already exceeds its MCL, and several other contaminants of concern could exceed MCLs over the next few hundred years. Other secondary contaminants of concern (e.g., uranium-238)

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[79] DOE/ID-11241, Remedial Investigation and Baseline Risk Assessment for Operable Unit 7-13/14, Section 7, 2006, Pg. 7-9.
[80] ID0-22054, DIGITAL MODELING OF RADIOACTIVE AND CHEMICAL WASTE TRANSPORT IN THE SNAKE RIVER PLAIN AQUIFER AT THE NATIONAL REACTOR TESTING STATION, IDAHO, J.B. Robertson, USGS Open-File Report Waste Management, TID-4500, May 1974, IDO-22054 and IDO-22056, Pg. 3.Cited in Citizens Guide to INL Pg. 146.

> could exceed MCLs several thousands of years in the future. To inhibit migration of contaminants from buried waste a surface barrier will be constructed to reduce infiltrating moisture that would move through the SDA and downward toward the Snake River." [81]
>
> "The radioactive nuclides in transuranic waste emit alpha radiation, which requires minimal shielding when outside the body but can severely damage human tissue if taken into the body by inhalation, ingestion, or other means (such as through cuts). Transuranic waste requires long-term isolation from the environment. It is produced during reactor fuel assembly, research and development, nuclear weapons production, and spent nuclear fuel reprocessing. Transuranic waste contains traces of plutonium, with lesser amounts of neptunium, americium, curium, and californium." [82] [emphasis added]

The crucial environmental issue is SDA waste contaminate migration into soil and aquifer that will last for millennia. The disastrous implication of leaving most of the buried mixed hazardous/ radioactive waste in place is intolerable because DOE's solution of only exhuming the small 10% "targeted waste" will leave a huge contaminate source (90% of TRU waste) in place. The Big Lost River that flows onto INL completely soaks into the aquifer (thus its name) so this personifies the porosity of the soil. This Snake River Plain Aquifer is the sole water source for hundreds of thousands of Idahoans. The Snake River is also a major tributary to the Columbia River. The aquifer under the INL is recharged by Big Lost River and other rivers that flow in from the mountains from the north and northeast.

So, there are important considerations of the water that flows in from the north and from the direction of Arco, underneath the Big Lost River. EDI addresses many RWMC specific issues and the importance of the direction of aquifer flow in that corner of the INL where the RWMC is located below. [83]

The "fast paths" (like the Big Lost River) of contaminate migration are the reason that the USGS started aquifer monitoring of the Magic Valley along the Snake River in the 1950s and 1960s. Contaminants arrive quickly via larger tube like paths (locally called lava tubes). The contamination will keep on coming and is not necessarily the peak contamination level, just because the contamination first arrived. Discussed below, "Dissolution of key contaminants are associated with metal debris buried at the SDA are contaminants that were produced in situ in metal reactor components by transmutation or activation." This represents what the hazard of dumping reactor fuel parts in the SDS pits/trenches prior to 1977 and later in soil vaults that DOE refuses to remove in its cleanup process. [84] See Section XII below. The issue of SDA waste contaminates migration into soil and aquifer is even described in the following DOE report:

> "Of particular interest are disposals of activated metals, especially irradiated beryllium blocks and reactor components made of stainless steel and Inconel (high nickel content) alloy. Irradiated beryllium blocks used as neutron reflectors at the [Test Reactor Area] TRA contain a significant percentage of the total buried inventory of C-14 and tritium estimated to occur in the SDA (DOE-ID 2002a). Activation products in irradiated stainless steel and Inconel include long-lived (C-14, Ni-59, Nb-94, and Tc-99) and short-lived (Co-60 and Ni-63). Some of the stainless steel was in the form of highly irradiated end pieces from Experimental Breeder Reactor-II fuel elements; these items were buried in scrap cask

[81] ICP-EXT-05-00784, Pg. iii

[82] EM-WM-04-083, INEEL CERCLA Administrative Record, SUBJECT: Approval to Proceed with Preparation of an Engineering Evaluation/Cost Analysis for the Idaho National Engineering and Environmental Laboratory Accelerated Retrieval Project Phase II in the Subsurface Disposal Area (EM-WM-04-083), 2nd Addendum OU 7.

[83] EDI June 2016 Newsletter - Environmental Defense Institute
www.environmental-defense-institute.org/publications/News.16.June.Final.pdf
"How much dilution can be expected as the plume moves south, southwest or southeast? The models being used by the Department of Energy represent mixing and dilution down aquifer from waste burial. But take a look at aquifer plumes and well monitoring values and a different perspective emerges. There are *fast paths*...

[84] Chuck Broscious Citizens Guide to INL (Section I-F) for the history of federal government designation of RWMC dump site.
http://www.environmental-defense-institute.org/publications/GUIDE.963.pdf

inserts that were open on top and perforated on the bottom, placing these disposed items in direct contact with the soil after burial (Salomon 2001)." [85]

"Dissolution:

"A number of key contaminants are associated with metal debris buried at the SDA. Tc-99, C-14, Nb-94, Ni-59 are contaminants that were produced in situ in metal reactor components by transmutation or activation. These activated elements are produced inside the metallic parts and are not surficial contamination. Activated elements are released to the environment by corrosion of the metal in which they were produced. To determine the release of the long-lived activated elements to the environment from the irradiated metals, it is necessary to determine the corrosion[2] rates of the metals.

"Corrosion of metal debris underground is a complex process. Soil oxygen, soil moisture, infiltrating precipitation, chemical species in the pore water, and soil bacteria contribute to faster rates of corrosion than observed in air alone.

"During spring thaw, the shallow RWMC soils may be in near saturated conditions, which can have high concentration of corrosive chemicals such as MgCl (Nagata and Banaee 1996). In certain areas, residual moisture levels can remain high which can lead to development of bacterial colonies on the surface of the metals, which in turn can create localized areas of corrosion. [emphasis added]

"Both soil clumps and microbial colonies on the metal surface can provide a mechanical barrier to soil gasses interacting with the steel. These localized areas are referred to as oxygen concentration cells where the metal beneath the barrier is exposed to less oxygen, becomes anodic with respect to the rest of the metal, and corrodes preferentially (Nagata and Banaee 1996)." [86]

"Americium-241 was determined in [Baseline Risk Assessment] BRAs to be a [contaminant of concern] COC associated with liquid and solid waste disposals to the subsurface at TRA, RWMC, and NRF (Table 4-1). The combined activity disposed from these facilities since 1952 is estimated to be about 1.83 u 105 Ci, with almost all of the activity attributed to wastes buried at the RWMC. The radioactive decay half-life for americium-241 is 432.2 years. Plutonium isotopes associated with solid wastes disposed to pits and trenches at the RWMC are available for release through surface washoff as locally derived infiltrating water comes into contact with those wastes. The kd was used in numerical analyses to evaluate release from the contaminated soil source term to the vadose zone. Protactinium-231 was identified as a COC at the RWMC. The half-life of protactinium-231 is 32,760 years." [INEEL/EXT-03-01169, pg. 4-3]

"Also, all tests on metal corrosion were performed on unirradiated metals. The difference between un-irradiated and irradiated metal, especially beryllium may have a significant effect on the corrosion rates (Adler-Flitton, Nagata, and Norby 2001). The characteristics of beryllium metal are greatly affected by irradiation, which causes the blocks swell and crack, increasing the effective surface area. Also, although corrosion is usually measured by differences in weight of specimens, the susceptibility of beryllium to corrode via pitting of the surface may be an important mechanism that increases potential releases of activation products versus what one might expect in estimating potential releases and the degree of corrosion based on weight loss alone. All estimates of corrosion rates have been consistently caveated with the need to gather empirical data to substantiate "reasonable guesses" of corrosion rates.

"Complexing agents – The presence of complexing agents in waste at the INEEL has not been evaluated. The formation of aqueous complexes in soil solutions can keep contaminants in solution and inhibit solution-solid reactions that retard the migration of contaminants. Decontamination solutions containing complexing agents such as citrate, oxalate, and EDTA (present in RFP waste as Verbenas) were used and disposed of in the SDA. Inorganic anions such as fluoride, carbonate, and phosphate can form aqueous complexes with contaminants. Exact amounts of complexing agents disposed at the SDA are not known, and anions are not always measured because they are not considered contaminants. Thus, the potential impact of complexing agents on release rates from buried waste at the SDA is not known." [87] [INEEL/EXT-03-01169, pg. 3-53]

Groundwater monitoring data show extensive migration of RWMC/SDA radioactive and hazardous contaminates into the underlying Snake River Aquifer. The DOE and USGS model uses dilution of contaminants incorrectly in order to maximize the dilution, so a lower contamination level results. This is in

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[85] INEEL/EXT-03-01169, INEEL Subregional Conceptual Model Report Volume 3: Summary of Existing Knowledge of Natural and Anthropogenic Influences on the Release of Contaminants to the Subsurface Environment from Waste Source Terms at the INEEL September 2003, pg. 3-35, INEEL/EXT-03-01169.

[86] INEEL/EXT-03-01169, Section 3.2.4.1

[87] INEEL/EXT-03-01169, Pg. 3-53

addition to overly optimistic soil sorption values, (Kd values). The Big Lost River soaks its entire volume into the aquifer on the INL due to the porous alluvial soils which also allow contaminate migration. "Most of the water entering the SDA during the flooding infiltrated the soils rather than dispersing via evaporation, transpiration or drainage." [88] SDA flooding is discussed in more detail below.

> "Surface water near the SDA is confined to the Big Lost River, which passes less than two miles north of SDA. The only surface water in the immediate SDA area occurs as runoff during heavy rains or snow melt. Flooding has occurred three times in recent years, in 1962, 1969, and 1982. During the 1962 flood, trenches 24 and 25, and pits 2 and 3 were opened and filled with water. In 1969, Pits 8 through 10 and Trenches 48 and 49 filled. And in 1982, flood water entered Pit 16 and trenches 42 and 49. Inventories indicate that the pits and trenches flooded contained radioactive, hazardous, and mixed waste." [89]

It's important to note that DOE requested from EPA concurrence to <u>reduce aquifer monitoring</u> frequency at the Radioactive Waste Management Complex beginning in Fiscal Year 2013. EPA responded by stating: that they "reviewed the request to <u>reduce aquifer monitoring</u> at the RWMC from semi-annual to yearly sampling. EPA approves of DOE's request." [90] Daryl Koch IDEQ/FFA/CO Manager Waste Management & Remediation Division also <u>concurred with limiting groundwater monitoring.</u>

Groundwater monitoring is the <u>only</u> way groundwater contaminate migration can be tracked. It's unconscionable that these regulatory agencies – likely fearing public knowledge of the extent of this hazard – via Freedom of Information Act/Public Records Requests – would find out. "Don't monitor what your trying to hide" from the public that relies on this sole source aquifer. Earlier DOE report show both water and air contaminate migration as shown below:

> "The most frequently detected analytes, in order of detection frequency, are VOCs [volatile organic compounds], plutonium isotopes, Am-241, and uranium isotopes.
>
> "Of the contaminants of potential concern, Pu-239/240 and Am-241 are the most frequently detected in surface soil samples (i.e., within the top 15 cm [6 in.]) inside and outside the SDA, at detection rates of about 22 and 21%, respectively. The high number of Pu-239/240 detections compared to Pu-238 suggests the plutonium is either from weapons-manufacturing waste in the SDA or from fallout. [xii]
>
> "A few constituents are consistently detected in the vadose zone (see Figure E-3), exhibit concentration trends, and show evidence of migration. Vadose zone constituents that have been identified as contaminants of potential concern, in order of their detection frequency from highest to lowest are VOCs, uranium isotopes, nitrate, Tc-99, and C-14. The following subsections summarize these constituents.
>
> "E-1.1.4.3.1 Volatile Organic Compounds**—**Carbon tetrachloride, tetrachloroethylene, and trichloroethylene are consistently detected in perched water and lysimeter samples. Each has been detected above MCLs in perched water samples and in shallow, intermediate, and deep lysimeter samples.
>
> "Methylene chloride is detected less frequently and at lower concentrations. Methylene chloride has been detected <u>above the MCL</u> in shallow lysimeter and perched water samples, but has not been detected in any intermediate or deep lysimeter [sic] samples. [emphasis added]
>
> "Uranium Isotopes**—**Uranium concentrations in all but one location in the vadose zone and aquifer are consistent with naturally occurring uranium. The one exception, TW1:DL04 in Pit 5 near Pad A, exhibits concentrations and isotopic ratios that clearly indicate uranium at this location is anthropogenic and slightly enriched with U-235." [91] [section E-1.1.4.3.2]

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[88] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment ,May 14, 1993, Pg. 4.7-15

[89] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment, May 14, 1993, Pg. 4.7-15

[90] RE: Reduce Aquifer Monitoring USEPA REGION 10 to DOE Nolan Jensen FFCA/CO Manager Re: Request for Concurrence to Reduce Aquifer Monitoring Frequency at the Radioactive Waste Management Complex Beginning in Fiscal Year 2013, IDEQ letter to DOE 4/10/13 Dear Mr. Jensen/DOE, EPA has reviewed the request to reduce aquifer monitoring at the RWMC from semi-annual to yearly sampling. EPA approves of DOE's request. Daryl Koch IDEQ/FFA/CO Manager Waste Management & Remediation Division, CCN 315061 EPA-DOE.

[91] DOE-ID-11241, Remedial Investigation and Baseline Risk Assessment for Operable Unit 7 13/14, May 2006, DOE-ID-11241, Section ***E-1.1.4.1 Waste Zone Data.***

Tami Thatcher's *Idaho Too Miss Important Idaho Settlement Agreement Milestones* report shows: "Even with the progress of shipping of above-ground stored transuranic waste and some buried transuranic waste, the "cleanup" will still leave plenty of transuranic waste over Idaho's aquifer. The americium-241 buried at the RWMC not being exhumed would require six Snake River Plain aquifers to dilute to drinking water standards. [92] [93] [94] [95] [96]

> "The graph of the migration of the buried waste at RWMC that will remain at RWMC buried in soil is shown below in Figure 1. The contamination migration is not realistically modeled by the DOE nor is it conservatively modeled. Flooding and fast paths of contaminant migration are ignored. [97] The ingestion doses will undoubtedly exceed the 30 to 100 mrem/yr radiation doses shown, intermittently at least. The CERCLA cleanup ignored doses after 10,000 years. Check out how, even after 100,000 years, the long lived radioactive waste, including americium-241, various plutonium and uranium isotopes, iodine-129, neptunium-237 and technetium-99, remains an ingestion hazard, even with the modeling assumptions biased toward retention in the burial grounds."
> "Americium-241, uranium-235, uranium-238, and plutonium-239 are top contributors to ingestion dose after 10,000 years. Beware, however, that contamination migration by the DOE appears to be modeled with a bias toward delaying

[92] See the CERCLA administrative record at www.ar.icp.doe.gov (previously at ar.inel.gov) and see also Parsons, Alva M., James M. McCarthy, M. Kay Adler Flitton, Renee Y. Bowser, and Dale A. Cresap, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267, 2014, Idaho Cleanup Project. And see Prepared for Department of Energy Idaho Operations Office, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, DOE/ID-11396, Revision 3, October 2014 https://ar.inl.gov/images/pdf/201411/2014110300960BRU.pdf

[93] An often repeated contrived excuse for limiting RWMC cleanup comes from the Record of Decision fuzzy artwork of "worker" risk per acre of waste dug up. It references administrative record report RPT-188 at ar.inel.gov. or ar.icp.doe.gov. It is used to defend digging around in only about 6 acres and not the entire 35 acres of buried waste at RWMC. Radiation worker risks are higher than DOE acknowledges, but they claim that radiation protections for DOE contractor radiation workers limit health risks. But the case was not actually based on a monitored radiation worker. It was based on an unmonitored state employee who receives an unmonitored 47 rem dose throughout his career if the cleanup extends from 6 years to 25 years. This argument, however, is immediately forgotten when discussing extending operations at the AMWTP to outside waste. There is no estimate of the number of people who will be dosed from the polluted aquifer. The gross conservatism of this unmonitored "worker" dose estimate was used to argue that cleaning up the entire mess would yield incrementally high worker doses for each additional acre cleaned up.

[94] DOE/EA-1793, US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote- Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA-1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf

[95] U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of Environmental Defense Institute's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

[96] INL/EXT-10-19168, Idaho National Laboratory, "Explanation of Significant Differences Between Models Used to Assess Groundwater Impacts for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste and Greater-Than-Class-C-Like Waste Environmental Impact Statement (DOE/EIS-0375D) and the Environmental Assessment for the INL Remote-Handled Low-Level Waste Disposal Project (INL/EXT-10-19168)," INL/EXT-11-23102, August 2011. http://www.inl.gov/technicalpublications/documents/5144355.pdf and a report prepared for the US Department of Energy, DOE Idaho Operations Office, "Preliminary Review of Models, Assumptions, and Key Data Used in Performance Assessments and Composite Analysis at the Idaho National Laboratory," INL/EXT-09-16417, July 2009. See p. 11, Tables 3 and 4 for sorption coefficients.

[97] Johnson, TM et al., *Geology*, "Groundwater "fast paths" in the Snake River Plain aquifer: Radiogenic isotope ratios as natural groundwater tracers," v. 28; no. 10; p. 871-874, October 2000.

> the release timing to be after 10,000 years. The EPA ignores post-10,000 contamination in its INL CERLCA cleanup." [98]

Idahoans' and downstream Snake River populations (like Boise) can be legitimately outraged by this new Agreement the State of Idaho and EPA's complicity to allow DOE to leave most of this mixed hazardous radioactive waste in place where it will continue to pose a significant hazard to the public and future generations. [99] [100]

Below Figure 4-2. All-pathways radiation dose for the Radioactive Waste Management Complex from raises issue of lateral aquifer recharge water from the nearby Big Lost River (geographically ~40 ft. above the SDA) [101] was found to be significant for nearby SDA as stated below:

> "The ABRA model included a steady-state influence of additional water above the C-D interbed to emulate the effect of the spreading areas. Sensitivity simulations, without this additional water, presented in the ABRA showed that the effect of the additional water was to dilute the resulting aquifer concentrations for contaminants that underwent dissolved-phase transport. This finding was most applicable for contaminants with long half-lives that do not undergo substantial decay during transit of the vadose zone. The influence of additional water from the spreading areas was not included in the RI/FS model. [Sec 2.5] [102]

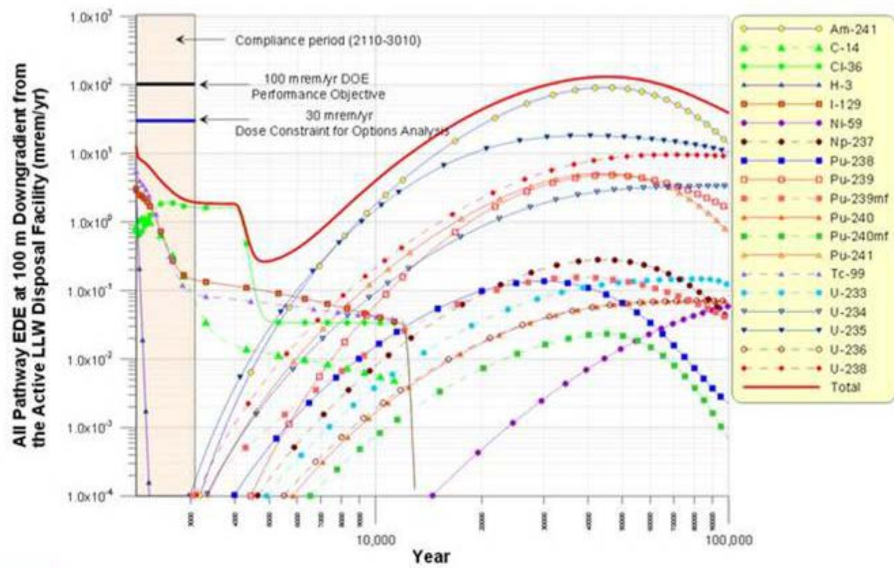

Figure 4-2. All-pathways effective dose equivalent 100 m downgradient from the Radioactive Waste Management Complex boundary from year 2110 to year 100,000 with cover infiltration rate equal to 1 cm/year.

[98] Tami Thatcher, Idaho Too Miss Important Idaho Settlement Agreement Milestones Environmental Defense Institute, News on Environmental Health and Safety Issues June 2018, Volume 29, Number 6. http://environmental-defense-institute.org/publications/News.18.June.pdf

[99] Thatcher, Tami, Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why This Matters. http://environmental-defense-institute.org/publications/kimamareport.pdf

[100] See references at the end of the report for additional information sources of contaminate migration.

[101] DOE/NE-ID-11244, Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site September 2008, DOE/NE-ID-11244, Prepared for the U.S. Department of Energy DOE Idaho Operations Office, DOE/NE-ID-11243 and DOE/NE-ID-11244.

[102] ICP-EXT-05-01016, Subsurface Flow and Transport Model Development for the Operable Unit 7-13/14 Remedial Investigation and Feasibility Study Revision 1, Sec 2.5, November 2006.

Flooding of the RWMC/SDA

DOE selected the RWMC as its main waste dump when INL was established in the 1950s because it was an area not suitable for anything else of value (i.e., reactors) plus it was easier to dig pits/trenches in the loose alluvial soils.[103] Flooding of the RWMC/SDA is another major contributor to the ongoing contaminate migration to the underlying Snake River aquifer that DOE's own reports acknowledge.

> "The RWMC is located within a natural topographic depression with no permanent surface water features. However, the local depression tends to hold precipitation and to collect additional runoff from the surrounding slopes. Surface water within WAG 7 [RWMC] and the surrounding local area does not reach the Big Lost River (Keck 1995). Surface water either eventually evaporates or infiltrates to the vadose zone and the underlying aquifer. (2-3).
>
> "Historically, the SDA has been flooded by local runoff at least three times because of a combination of snowmelt, rain, and warm winds. Dikes and drainage channels were constructed around the perimeter of the SDA in 1962 in response to the first flooding event. The height of the dike was increased and the drainage channel around the perimeter was enlarged, following a second flood in 1969.
>
> "The dike was breached by accumulated snowmelt in 1982, resulting in a third inundation of open pits within the SDA. Significant flood-control improvements included increasing the height and breadth of the dike, deepening and widening the drainage channel, and contouring to eliminate formation of surface ponds and to route runoff to the drainage channel localized runoff from surrounding slopes is now prevented from entering the SDA by the perimeter drainage channel and dike surrounding the facility.). [2-15] [104]
>
> "Runoff from inside the SDA is directed to the perimeter drainage channel where it exits the disposal area. channel along Adams Boulevard are adequate to protect the SDA from the 25- and 100-year combined rain and snowstorm events (Dames & Moore 1993).[2-15]
>
> "Before 1957, the radiation level was not limited for any disposal, and items registering up to 12,000 R/hour were buried. Both non-routine and routine solid waste was covered with soil, but according to different schedules." [105]

US Geological Survey (USGS) hydrologist Barraclough estimates that 100 acre-feet (32,492,910 gallons) of direct precipitation landed on the RWMC between 1952 and 1970. Additionally, due to the low depression of the RWMC local run off has entered the burial ground adding to direct surface water introduction. The 1962 flood which inundated the SDA allowed 30 acre feet (10,000,000 gallons) into the SDA. The 1969 flood put 20 acre feet (6.4 million gallons) into the SDA. [106] It is no wonder radionuclides are found in the Snake River Aquifer. "Adams and Fowler measured solubility of plutonium in tap water and found a range of 46,000 to 130,000 pCi/l."... "These findings are also consistent with Hagan and Miners (1970)." [107]

According to DOE sponsored studies, the presence of gamma radiation increases the permeability/leach-ability of contaminates in basalt by ten-fold. [108] Water samples taken in the flooded SDA pits during the 1969 flood contained 13,000 pCi/l gross beta and 2,700 pCi/l gross alphas. [109] This data verifies the solubility of radionuclides and the water sample data from the deep monitoring wells verify the mobility of these contaminates. Additionally, USGS soil samples under Pit 10 showed plutonium at 400,000 pCi/g and under Pit 2 the Pu was at 320,000 pCi/g which confirms contaminate mobility. [110] [IDO-22056@77]

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[103] See Citizens Guide for history of INL and the choice of RWMC as the primary nuclear waste dump http://www.environmental-defense-institute.org/publications/GUIDE.963.pdf

[104] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002, Pg. 2-15

[105] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002

[106] IDO-22056, Hydrology of the Solid Waste Burial Ground, as Related to the Potential Migration of Radio-nuclides, INEL, J. Barraclough et al., US Geological Survey, August 1976, Open File Report 76-471, Pg. 46.

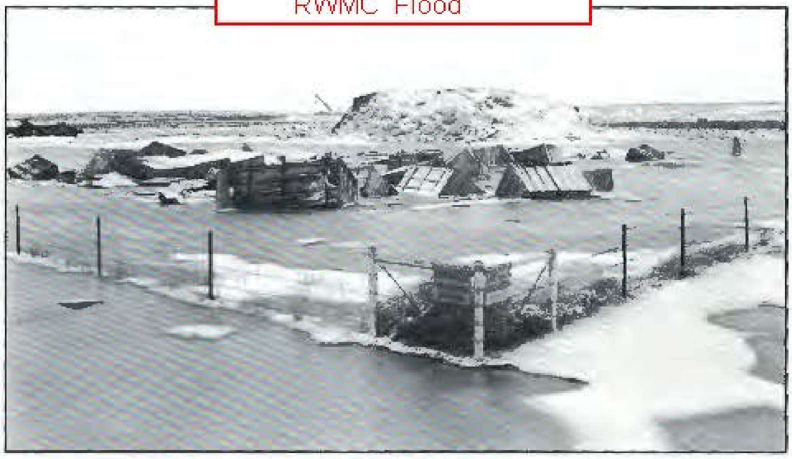
[107] ibid., IDO-22056, pg. 70

[108] EGG-J-02083, Leach Testing of INEL Waste Forms in a Gamma Field, R. Schuman, EG&G Idaho.

[109] ibid., IDO-22056, pg. 69-70

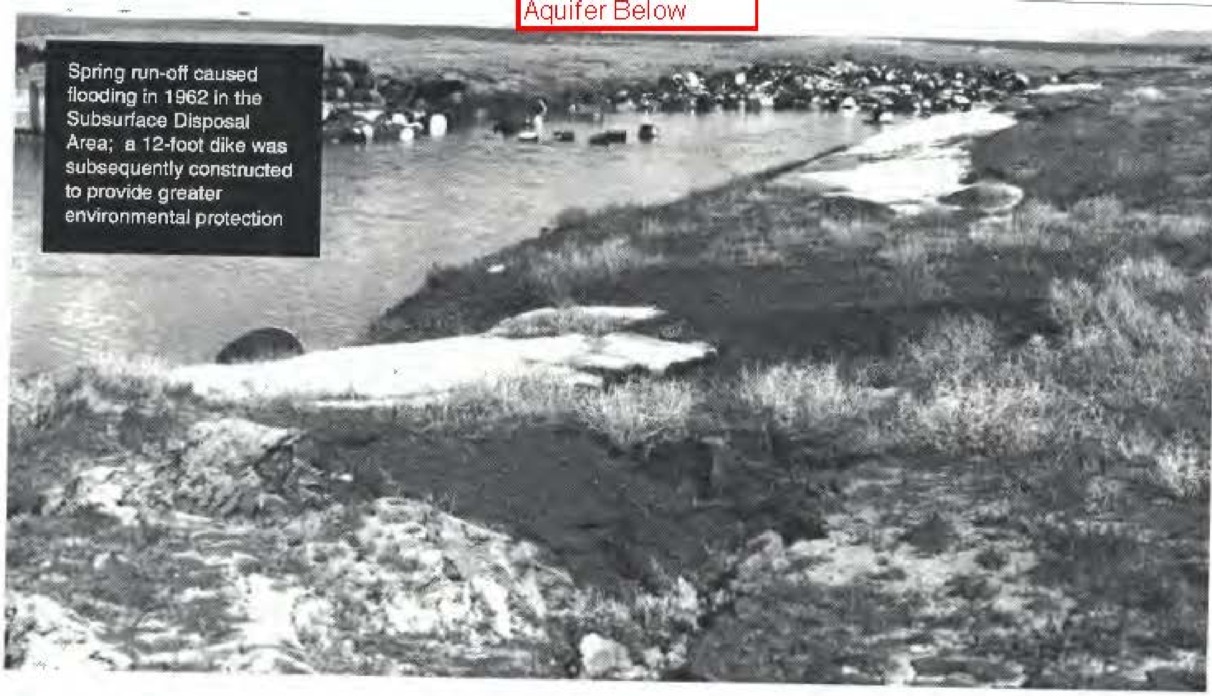
[110] ibid., IDO-22056, pg. 77

RWMC Floods 1962 and1969
No photos available on 1982
RWMC Flood



Taken in January 1969, this photo of Pit 9 shows material that "surfaced" when the area was flooded. (69-881) Some of the waste in Pit 9 was retrieved in 2004.

Flood Water Flush
Contaminates into
Aquifer Below



Spring run-off caused flooding in 1962 in the Subsurface Disposal Area; a 12-foot dike was subsequently constructed to provide greater environmental protection

DOE-ID
Photos

Flooding (as noted above) of the RWMC and its Subsurface Disposal Area (SDA) from the Big Lost River has occurred at least three times (1962, 1969, and 1982) since 1950. In 1962, Trenches 24 and 25 plus Pits 2 and 3 were flooded. In 1969, Trenches 48 and 49 plus Pits 8, 9, and 10 were flooded. In 1982, Trenches 42 and 49 plus Pit 16 were flooded. [111] [EG&G-WM-10090@3] According to topographical map (INC-B-15368) of the burial ground area and a part of the Big Lost River ponding areas, the burial ground lies 40 feet below the Big Lost River 2 miles north. [112] [IDO-22056@8]

A flood-control diversion dam was been built to mitigate flooding. A USGS 1976 "Analysis of historical stream-flow information indicate that floods in the Big Lost River would overtop the flood-control diversion dam about once in every 55 years on average; if the culverts in the dam are completely plugged, overtopping of the dam would occur about once every 16 years." [113] [IDO-22052@iii] The 1982 flooding of the SDA was in fact caused by plugging of the culverts. [114] [EG&G-WM-10090]

Since the RWMC is the lowest point in the region, there is nowhere else for the water to go. Currently, sump pumps are required to remove water out of the RWMC due to its lack of drainage. [115] [IDO-22052 pg.10] This drainage problem begs the question of long-term institutional control to prevent flooding after DOE is gone and no one to maintain whatever sump pumps and diversion dams currently provide limited flood control. [116] Contaminate migration has significant health effects on users of Snake River Aquifer.

> **"Estimates of cumulative human health and ecological risks**
>
> "Estimates of cumulative human health and ecological risks associated with the Subsurface Disposal Area are presented in this Ancillary Basis for Risk Analysis. Twelve radionuclides and four chemical contaminants are identified as human health contaminants of concern: Am-241, C-14, 1-129, Nb-94, Np-237, Sr-90, Tc-99, U-233, U-234, U-235, U-236, U-238, carbon tetrachloride, methylene chloride, nitrates, and tetrachloroethylene. In addition, Pu-238, Pu-239, and Pu-240 are classified as special case contaminants of concern to acknowledge uncertainties about plutonium mobility in the environment and to reassure stakeholders that risk management decisions for the Subsurface Disposal Area will be fully protective. In the ecological risk assessment described in this document, four radionuclides and three chemicals were identified as ecological contaminants of concern: Am-241, Pu-239, Pu-240, Sr-90, cadmium, lead, and nitrates.
>
> "At the Subsurface Disposal Area, transuranic and mixed waste, mostly from the Rocky Flats Plant in Colorado, were disposed of through 1970. Mixed waste containing hazardous chemical and radioactive contaminants was accepted through 1984. Since 1985 waste disposals in the Subsurface Disposal Area have been limited to low-level radioactive waste from INEEL waste generators. Waste is buried in pits, trenches, and soil vaults, as illustrated." [117]
>
> "Implementation Actions and Mechanisms—The INL Site-wide institutional controls plan will include controls to prevent use of groundwater that exceeds MCLs for drinking water or irrigation. Prohibit use of groundwater for drinking water or irrigation purposes in the portion of the aquifer that exceeds MCLs within the land-use control boundary (i.e., groundwater and drilling institutional control area) until groundwater quality has been restored. Control drilling of new wells and boreholes within the land-use control boundary (i.e., groundwater and drilling institutional control area) to

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[111] EG&G-WM-10090, Sampling and Analysis Plan for RWMC Subsurface Disposal Area, EG&G Idaho April 1992, Pg. 3.
[112] ibid. IDO-22056@8
[113] IDO-22052, Probability of Exceeding Capacity of Flood Control System at the National Reactor Testing Station, US Geological Survey, P. Carrigan, Jr., January 1972, TID-4500, IDO-22052, pg. iii.
[114] EG&G-WM-10090, Sampling and Analysis Plan for RWMC Subsurface Disposal Area, EG&G Idaho April 1992.
[115] Ibid, IDO-22056 @10
[116] EDI Comments in INL's Calcine Storage Vulnerability, by Tami Thatcher *www.environmental-defense-institute.org/publications/EDICalcineComments.pdf*
July 11, 2016 - Environmental Defense Institute. Page 6 of 12 buried wastes at RWMC that will remain at RWMC buried in soil is shown below in Figure 1. The contamination migration is not realistically modeled by the DOE nor is it conservatively modeled. Flooding and *fast paths* of contaminant migration are ignored. Pg. 11
[117] INEE-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002, Pg. 2-15.

prevent spreading contamination to the aquifer. The INL Site-wide institutional controls plan will include a process for Agency review of plans for drilling new wells and boreholes in those areas exceeding MCLs attributable to RWMC releases until water quality has been restored to below at drilling techniques and planned uses of wells a conduit for accelerated infiltration of contaminants. [118] [52] [emphasis added]

DOE's vapor extraction program at the RWMC over the last decade or more was hoped to pull the Volatile Organic Compounds (VOC) out of the SDA waste but in practice it is only recovering about one-third of the targeted chemical waste dumped. As the below report below shows there were over 1.8 million lbs. dumped. This VOC extraction may be the source of air contamination reported around Idaho Falls, 35 miles to the southeast.

"The OU 7-08 ROD (DOE-ID 1994a) lists CCl_4, PCE, TCE, and 1,1,1-TCA as COCs but only lists a cleanup goal for CCl_4, because successful treatment of CCl_4 will also reduce the other COCs. The original estimated volume of CCl_4 buried in the SDA was 325,000 lb., but that estimate was revised to 1,800,000 lb. in the spring of 2001 based on additional information obtained from the Rocky Flats Plant."

"Groundwater monitoring currently indicates two of 20 wells in the RWMC area (M7S and the RWMC production well) are above the MCLs for CCl_4. Some of the wells continue to show a slightly increasing trend in CCl_4 concentrations, while others indicate a flat or decreasing trend." [119] [10-1][emphasis added]

Water in the SDA was studied in considerable detail because this is a significant indicator of future contaminate migration into the underlying vadose zone and aquifer below the RWMC. Water probes were inserted into various parts of the SDA waste and found the following:

2.5.2 Success in Meeting the Purpose Water probes:

"Over two-thirds of the SMR probes are providing data, with some clearly indicating infiltration. Most infiltration at the SDA results from snowmelt in the early spring when little or no evapotranspiration occurs. Infiltration in the subsurface is usually observed from March through June. The amount of precipitation and frozen ground under snowmelt influence the amount of infiltration that reaches the subsurface. In the years since the SMR probes were installed (i.e., 2001), precipitation has been slight—in most years, less than half the long-term average of 21.6 cm (8.5 in.) per year. Even so, if the snowmelt occurs over frozen ground, causing the melt water to redistribute to low areas in the SDA (e.g., along roadway ditches), deep infiltration can occur in those areas even though precipitation is slight. In that case, only those probes located near water-accumulation areas are likely to show infiltration, even though all of the probes might be working. [Pg.25]

"One of the biggest limitations of moisture data results from the probes not being calibrated to SDA waste. However, no way is currently available by which probes may be calibrated to the waste, because of waste heterogeneity. This results in qualitative measurements in the waste zones. When placed near conductive material, the measurement typically is exaggerated, yielding moisture measurements as high as 100% in these zones. The probes were calibrated to the moisture extremes of air and water; this calibration is sufficient to provide quantitative data from soil. [120] [Pg.27] [emphasis added]

"Tensiometer probes provided valuable quantitative water-potential data from above, within, and below the waste. These data indicate that some of the waste locations are within the tensiometric range where there is a higher potential for water and contaminant transport. Several probes indicated water infiltration while saturated conditions were not detected. [Pg.47]

"Section 4. Most of the retrieved waste is sent to WIPP. Idaho CERCLA Disposal Facility waste acceptance criteria (DOE-ID 2013b) apply to waste streams sent there for disposal (e.g., CERCLA secondary waste); however, targeted waste is not disposed of at the Idaho CERCLA Disposal Facility or other INL Site facility. All targeted waste is shipped out of the State of Idaho. Secondary waste was disposed of in the pit, as previously discussed. Further discussion of secondary waste is included in Section 3.2.11. [pg57]

"Radionuclides that would exceed 25% of the drinking water standards are neptunium-237, plutonium-239, plutonium-

[118] DOE-ID-11482, Phase 3, Operable Unit 7-13/14 Phase 3 Remedial Design Work Plan November 2013, Pg. 52.

[119] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007, DOE/NE-ID-11201.

[120] ICP-EXT-05-00784, Pg. 25 and 27.

240, technetium-99, uranium-234, and uranium-238. These radionuclides all have half-lives, with the minimum half-life being 6,537 years for plutonium-240." [121] [emphasis added]

Figure 10 color graphic below that shows the high the moisture content is in the SDA waste.

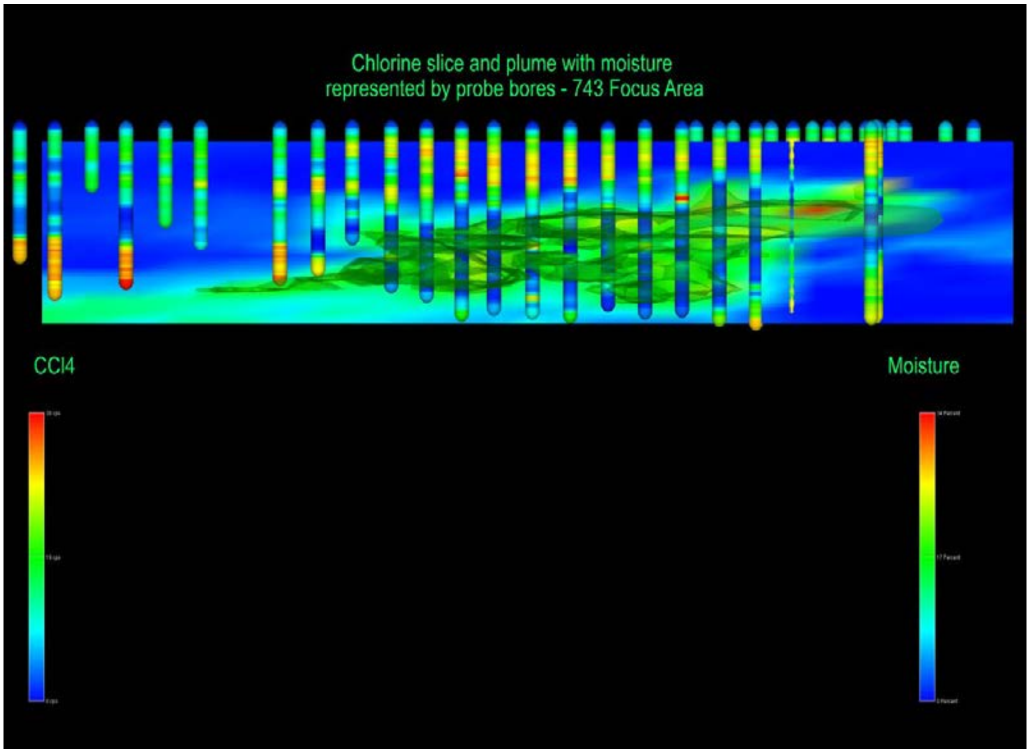

Figure 10. Two-dimensional graphic showing chlorine and moisture data from probes in the Series 743 Focus Area. Note the inverse relationship where there is little moisture when chlorine values are higher. [122]

V. Difficulty in Detecting TRU, Plutonium and Other Alpha Emitting Radionuclides in SDA Waste

Herein lies one of the major fundamental flaws in DOE claims to be able to appropriately identify TRU waste in the "Accelerated Retrieval Program (ARP). DOE claims that trained operators using remote video and some detection monitors to legitimately determine what is TRU (alpha emitting isotopes) and what is not. Their monitors simply cannot get close enough to the waste in the trench without extracting it completely in a "glove box" type arrangement to do legitimate determinations as their own reports states:

> "To achieve adequate detection sensitivity, the distance of the alpha detector from the dig face cannot be more than a few inches. The closer the detector to the soil the better the alpha detection. However, the distance will be limited by the scanner's ability to position the detector next to the irregular surface of the face. Considering this restriction on distance, instrument sensitivity must be as high as possible or detection of alpha particles might not be made.
>
> "Real-time radiography is required to determine the contents of intact barrels or boxes. The degree of uncertainty in the nuclear assay system's measurement ability to define whether waste is low level or TRU waste depends on some knowledge of the mixture of waste in the waste container being assayed. Specific items to be measured/detected are metals, liquids, pressurized bottles or cylinders, explosives, packing material, container integrity, etc... . [Pg. 18]

[121] ICP-EXT-05-00784, Pg. 47 and 57.
[122] ICP-EXT-05-00784, Pg. 43.

"Waste characterization requires exhaustive spectrum analysis of waste packages. Best results are obtained when measuring homogeneous waste. Detecting plutonium requires, as a minimum, a high-energy neutron radiography facility capable of scanning the waste under precisely controlled conditions and configuration. It appears that more studies of the technique and instrumentation to characterize waste need to be done to allow finalization of the assay system location in the waste stream and functional design.
[pg. 30]
"Real-time radiography is required to determine the contents of intact barrels or boxes. The degree of uncertainty in the nuclear assay system's measurement ability to define whether waste is low level or TRU waste depends on some knowledge of the mixture of waste in the waste container being assayed. Specific items to be measured/detected are metals, liquids, pressurized bottles or cylinders, explosives, packing material, container integrity, etc.
"Detecting Plutonium for Determining Criticality: The method of an in situ measure of the plutonium by volume in the dig face before excavation remains to be defined. It appears that the method must be developed for this unique configuration. Assurance is needed that the plutonium present in the waste cannot be configured during retrieval in a mass that could cause criticality. [123] [Pg.31] [emphasis added]

The above discussion on the difficulty in correctly identifying "targeted TRU" waste is crucial when DOE is doing everything to minimize the TRU waste volume extracted because of a number of factors. 1.) Cost; 2.) WIPP's limited capacity; and of course it's the easiest solution to leave waste in-place. DOE can reasonably comply with the legal requirements applicable in the EPA's Land Disposal Restrictions for all mixed TRU and hazardous radioactive waste by simply hauling it a few miles up the road to its own fully permitted CERCLA facility site.

"2.1.2 Other Nearby Low-Level Waste Disposal Facilities
"The Idaho CERCLA Disposal Facility (ICDF), approximately 16 km (10 mi) northeast of RWMC, was constructed in 2002 and began accepting LLW disposals in 2003. The ICDF is an on-Site, engineered facility, located south of INTEC (formerly the Idaho Chemical Processing Plant), that meets the substantive requirements of RCRA Subtitle C, Toxic Substances Control Act polychlorinated biphenyl landfill design and construction requirements. The ICDF is scheduled to continue to accept INL CERCLA-generated waste streams for a 15-year operations period. Current projections of the site-wide CERCLA waste volumes total about 389,923 m3 (510,000 yd3) (DOE-ID 1999a).
"Beryllium was of special interest because it contains approximately 13% of the total C-14 inventory in the SDA. Beryllium exposed to moisture corrodes relatively rapidly, releasing C-14. This approximate 13% of the total inventory of C-14 makes up about 90% of the mobile C-14. The remaining total C-14 is in stainless steel and other alloys, which corrode at a much slower rate than beryllium. Thus this action targeted the near-term risk of C-14 release from the beryllium reflector blocks and outer shim control cylinders (Lopez et al. 2005). [2-5]
"Past the apparent low-permeability zone, flows in the aquifer increase significantly. For receptors downgradient from the low-flow zone, CERCLA modeling estimates average linear velocities in the aquifer of about 1,000 m (3,281 ft.) per year. This rate is consistent with past estimates of the INL Site aquifer as a whole. [124] [pg.3-8] [emphasis added]

As discussed above #2 of factors why DOE is doing everything to minimize the volume of waste extracted from the SDA buried waste is because of WIPPs limited capacity.

"To place these volumes and TRU activities in perspective, the disposal capacity of WIPP is about 175,600 m^3. Of this total, no more than above 7,080 m^3 can be remote-handled waste, i.e., having a contact dose rate in excess of 200 mrem/yr. The remaining volume capacity is for contact-handled TRU waste. In addition, the WIPP LWA limits the total remote-handled TRU waste curie content to 5,100,000 curies. The total activity of TRU radionuclides in the waste currently targeted for disposal at WIPP is about 5,800,000 curies. Of this total, less than 1 million curies is associated with remote-handled waste (DOE 1997c). A total of 117,000 m^3 containing 2,510,000 curies of TRU activity was in retrievable storage at the end of 1998. Thus, even though

[123] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007, Pgs. 18, 30 and 31. Also see EGG-WM-8296, Executive Summary of the EG&G Idaho Buried Waste Program Retrieval Project, October 1988, for difficulty in remotely classifying waste for retrieval.
[124] DOE/NE-ID-11244, Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site September 2008, Prepared for the U.S. Department of Energy DOE Idaho Operations Office, Pgs. 2-5 & 2-8.

> the *untreated* volume of previously disposed of TRU waste (137,000 m^3) is comparable to the disposal capacity of WIPP, this waste only contains about 10 percent of the TRU activity in the wastes ultimately planned for disposal at WIPP. [125] [pg. 18] [emphasis added]

DOE's use of historical records to determine where the targeted waste is can be argued as bogus just by seeing the above photo of the waste shipment just randomly dumping barrels of rocky flats into a trench. It's simply absurd to claim there was any systematic records of what waste went where. As the compromised 2008 Agreement to Implement stipulates:

> "Section J. Based upon operational experience to date and the limitations of technology, other forms of Transuranic Waste located in the Subsurface Disposal Area are difficult to segregate or discern during retrieval from. non-Transuranic Wastes.
>
> "Section K. As described in Sections II.F-J above, the Parties used historic disposal records generated by DOE to identify areas within the SDA where retrieval is, based upon current knowledge and technological capabilities, appropriate in light of countervailing considerations of worker safety and national security. The Parties based the identification of these areas upon the following criteria:
>
> Absence of classified materials in proximity to Targeted Waste that, for
>
> 1. Estimated concentrations of curies of transuranic elements;
> 2. Density of Targeted Waste;
> 3. Amount and type of non-Targeted Waste requiring handling to retrieve and the corresponding risks posed to workers or the environment and impacts on retrieval practicability (e.g., considerations given to areas with high gamma radiation or biological hazards, posing undue risks to workers, and areas containing large, unwieldy objects [like nuclear reactors] making retrieval impracticable);
> 4. Reasonable efficacy of retrieval technology in locating Targeted Wastes within the SDA;
> 5. national security reasons, would make retrieval impracticable;
> 6. Collocation of other environmentally detrimental wastes such as volatile organic compounds; and
> 7. Existence of effective alternatives to retrieval to address environmental or health risks posed by leaving potential Targeted Waste in place.[Pg. 4&5] [126]

Other DOE sites (i.e., Hanford and Savannah River) within the national DOE complex also have huge legacy waste slated for WIPP. So the competitive incentive is to get as much of their waste in WIPP before it's full, because there is no alternative for TRU waste as we have seen with the lack of a high-level waste repository (i.e., Yucca Mt.). It's obvious to any observer that DOE/INL has a huge incentive to limit the amount of exhumed waste from the SDA not only because of the cost but also WIPP's limited capacity.

Section VI. Phase I Remedial Action for Targeted Waste Retrieval Program [127]

DOE's public announcement is that the waste "Retrieval Actions" at the Radioactive Waste Management Complex (RWMC) in the new 2008 Idaho "Agreement to Implement" is completed and therefore all the employees at the Advanced Mixed Waste Treatment Facility (AMWTF) will be out of work. So, as discussed earlier in Section I above, DOE has been accepting new waste from around the DOE Complex to "process" TRU waste in preparation for shipment to WIPP as an excuse to keep the RWMC/AMWTP operating.

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[125] Buried TRU at Complex Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, June 2000, pg. 18

[126] AGREEMENT TO IMPLEMENT U.S. DISTRICT COURT ORDER DATED MAY 25, 2006, Pg. 4&5, commonly referred to as the 2008 Agreement to Implement because that is when it was signed by all the Parties.

[127] DOE-ID-11396, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, October 2014, Revision 3, pg. Hereinafter DOE-ID-11396.

As of this writing, work in structures one through seven of the Accelerated Retrieval Project (ARP) has been completed. Retrieval work in ARP VIII is nearly complete and ARP IX is under construction. Crews at RWMC have exhumed 4.47 acres of the 5.69 acres required by the 2008 Record of Decision, there are 1.2 acres left to remediate in ARPs VIII and XI. The exhumation should be completed by the conclusion of 2019. The ARP project is nearly two years ahead of the initial projected completion date. Vacuum vapor extraction has removed only 246,000 pounds of solvent vapors (about 1/3 total) from beneath the SDA and it continues to operate. In November of last year, RWMC workers completed exhumation of the 7,485 cubic meters of TRU waste required by the Record of Decision.

The ARPs are <u>Not</u> targeting TRU waste because they have specifically targeted the chemically-laden waste because carbon tetrachloride was already exceeding the MCL in 2008. This is described in DOE cleanup documents describing the ARPs. [128] There may have been some consideration of the TRU waste, but the targeted waste was defined to emphasize removing very chemically laden waste. The end result for the RWMC after all remediation work is completed will be the installation of a cap no later than 2028, as mandated by the Idaho Settlement Agreement. The design for this final cap is in the early stages.

No discussion is apparent that AMWTP workers should go back into the SDA and exhume all the TRU, LL alpha and mixed hazardous waste in accordance with 1995 Settlement Agreement, that if left in place, will continue to be a source of contaminate migration into the aquifer thereby threatening Idaho's sole source water supply. But the Agencies think that the current targeted waste retrievals results in "clean enough."

> "Targeted waste retrievals at the Subsurface Disposal Area (SDA) were initiated under action memoranda as non-time-critical removal actions (i.e., Accelerated Retrieval Projects [ARPs] I, II, and III) under Section 104 of CERCLA and continued under the OU 7-13 /14 Record of Decision (ROD). The original Phase 1 Work Plan presented sequence and schedules for the first 4 of 10 primary retrieval areas identified in the ROD (i.e., ARPs I, II, III, and IV*)*, with subsequent areas to be addressed in periodic revisions. The first revision to the Phase I Work Plan provided sequence and schedules for ARPs V, VI, and VII. ARPs I through VI are now complete, and excavation has begun in ARP VII. This second revision to the Phase I Work Plan provides sequence and schedules for the last two retrieval areas, ARPs VIII and IX. Phase I continues to apply ARP-based techniques (e.g., design, construction, and procedures) as retrieval proceeds to new areas. <u>The Agencies approve this approach and do not require additional remedial design for targeted waste retrievals unless change is necessary.</u> The focused objective of targeted waste retrieval is to remove specific waste forms that are highly contaminated with solvents, transuranics, and uranium. Targeted waste streams are Rocky Flats Plant Series 741 sludge, Series 742 sludge, Series 743 sludge, graphite, filters, roaster oxides, and other waste streams mutually agreed to by the Agencies, as the result of operational experience or process knowledge to be routinely transuranic waste. If a waste stream is not identified as targeted, it is nontargeted waste by definition. The performance measure for targeted waste retrieval is removal of a minimum volume of 6,238 m3 from a minimum of 5.69 acres of specific pit areas identified in the ROD. Ten discrete portions of the SDA are primary targeted waste retrieval areas composing the 5.69 acres." [129] [emphasis added]

As discussed above, the definition of targeted waste and how it is identified above is not defined by how much TRU it has. Because aquifer levels of carbon tetrachloride were already exceeding federal drinking water MCLs, the emphasis was on removing some of this chemical waste. It's encouraging that mixed hazardous/radioactive waste is appropriately targeted but not also TRU/ alpha LLW. Moreover, this

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128 Ibid. DOE-ID-11396.

129 DOE-ID-11389, pg. v. Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals Revision 3, Oct 2014, DOE-ID-11389, pg. v. Hereinafter DOE-ID-11389.

decision by the Agencies to limit the removal action to "targeted waste retrieval means the removal of a minimum volume of 6,238 m3 from a minimum of 5.69 acres" is a continuation of the fundamental error to revise the Settlement Agreement to at least 65,000 cm of waste to be removed from the RWMC that states in pertinent part:

> "B. Transuranic Waste Shipments Leaving Idaho: 1. DOE shall ship **all transuranic waste now located at INEL, currently estimated at 65,000 cubic meters in volume, to the Waste Isolation Pilot Plant (WIPP) or other such facility designated by DOE,** by a target date of December 31, 2015, and in no event later than December 31, 2018. DOE shall meet the following interim deadlines..." [Emphasis added]. [130]

EDI warned then Governor Andrus and subsequently Governor Batt that the 65,000 cm estimate was inadequate and DOE will disregard the "ship ALL transuranic waste" caveat. In fact current Governor Otter in 2006 further amended the original 1995 Settlement Agreement that included in pertinent part:

> "As described above, the Parties used historic disposal records generated by DOE to identify areas within the SDA where retrieval is based upon current knowledge and technological capabilities, appropriate in light of countervailing considerations of worker safety and national security. The Parties based the identification of these areas upon the following criteria:
>
> 1. "Estimated concentrations of curies of transuranic elements;
> 2. "Density of Targeted Waste;
> 3. "Amount and type of non-Targeted Waste requiring handling to retrieve and the corresponding risks posed to workers or the environment and impacts on retrieval practicability (e.g., considerations given to areas with high gamma radiation or biological hazards, posing undue risks to workers, and areas containing large, unwieldy objects making retrieval impracticable);
> 4. "Reasonable efficacy of retrieval technology in locating Targeted Wastes within the SDA;
> 5. "**Absence of classified materials in proximity to Targeted Waste that, for national security reasons, would make retrieval impracticable**;
> 6. "Collocation of other environmentally detrimental wastes such as volatile organic compounds; and
> 7. "**Existence of effective alternatives to retrieval to address environmental or health risks posed by leaving potential Targeted Waste in place."** [emphasis added] [131]

This new above 2008 "Agreement to Implement" by current Idaho Governor Otter gave DOE enough slack to do the absolute minimum with the RWMC Subsurface Disposal Area (SDA) Waste Retrieval Project and undermine the intent of the original 1995 Agreement. Former Governor Andrus who originated the suit against DOE's for turning Idaho into defacto a waste dump, was so upset with these new agreements that he went back to court in 2015 trying to gain access to documents used in these radioactive waste deals. [132]

> "Advocates for the West filed a suit on behalf of former Idaho Gov. Cecil D. Andrus against the Department of Energy in an effort to force the federal agency to comply with the Freedom of Information Act and share more information related to the proposed shipments of commercial spent nuclear fuel to the Idaho National Laboratory. The lawsuit comes after

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[130] 1995 Settlement Agreement The State of Idaho, through the Attorney General, and Governor Philip E. Batt in his official capacity; the Department of Energy, through the General Counsel and Assistant Secretary for Environmental Management; and the Department of the Navy, through the General Counsel and Director, Naval Nuclear Propulsion Program, hereby agree on this 16th day of October, 1995, to the following terms and conditions to fully resolve all issues in the actions Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL (D. Id.) and United States v. Batt, No. CV-91-0065-S-EJL (D. Id.)[pg.1]

[131] Agreement to Implement U.S. District Court Order Dated May 25, 2006, signed by Governor C.L. "Butch" Otter, Attorney General Lawrence Wasden, and James Rispoli Assistant Secretary U.S. Department of Energy, pg. 5.

[132] See: http://advocateswest.org/case/keeping-nuke-waste-idaho/ and read the complaint filed in the US District Court for the District of Idaho at: http://www.advocateswest.org/wp-content/uploads/2015/03/9-29-15-INL-FOIA-complaint.pdf

months of effort by Andrus to require DOE to provide relevant and timely information about its request for a "waiver" from the 1995 Idaho Settlement Agreement." [133]

Idahoans are not satisfied with the current DOE RWMC Subsurface Disposal Area (SDA) Waste Retrieval Project and must bring these issues to Idaho Attorney General Wasden's attention before DOE completes the Retrieval Project.

"From 1952 to 1970, radioactive waste was buried in pits, trenches, and soil vault rows (SVRs) excavated into a veneer of surficial sediment. This sediment is underlain by a series of basaltic lava and sedimentary deposits. In 1970, the shallow burial of TRU waste ended. Since 1970, burial of low-level and other radioactive waste has continued, and TRU waste has been stored on above ground asphalt pads in retrievable containers. Between 1952 and 1997, approximately 215,000 m3 (7,592,653 ft3) of radioactive waste containing about 12.6 million Ci of radioactivity was buried at the SDA (French and Taylor 1998). [pg4] [134] [emphasis added]

"The INEEL [now INL] has the next largest volume of buried TRU waste and the largest curie inventory by far, with a total of 36,800 cm containing 634,000 curies of TRU activity (63% of which is plutonium-241, a non-alpha-emitting radionuclide with a 14.4-year half-life). This reported activity represents the initial emplaced curies. The decayed activity (297,000 curies in year 2006) is less than half of the curie content initially emplaced, largely due to radioactive decay of plutonium-241." [135] [emphasis added]

"Performance standards and cleanup goals for [accelerated retrieval project] ARPs completed to date have been satisfied since excavation of the specified retrieval area for each ARP is complete; however, the performance goal with respect to the minimum volume to be retrieved will not be assessed until all retrieval areas are complete, at which time the cumulative targeted waste volume retrieved will be evaluated against the minimum waste volume of **6,238 m3** of targeted waste (as disposed of), as stipulated in the ROD. Compliance shall be measured as 7,485 m3. [136] [pg. 80] [Emphasis added].

Given the previous DOE accounting of radioactive waste dumped in RWMC between 1954 and 1970 , as discussed above (215,000 m3) (7,592,653 ft3) of radioactive waste containing about 12.6 million Ci of radioactivity was buried at the SDA), "The approximate total volume of TRU waste currently buried at the SDA is 2 million ft3. [137] 2 million cu ft. = 56,657 cm. The above 6,238 cm targeted waste in the retrieval project is only 13.2 % of the total 56,657 cm TRU in the SDA. This shows the deliberate fundamental inadequacy of DOE's retrieval operation that the IDEQ and EPA bought into. It also correlates to the above 10% figure DOE had in mind in 1988. DOE never intended to commit the resources to exhume all the TRU and low-alpha dumped in RWMC/SDA or honor the 1995 Settlement Agreement.

We must continue to emphasize that this mixed hazardous radioactive waste is the most biologically dangerous material in the world. [138] Policy makers in the 1970s who passed RCRA laws knew the risk this waste posed to the environment and the public health and therefore must be disposed with appropriate strict safeguards – all of which INL is violating at the SDA.

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[133] Tami Thatcher reporting October 2015 EDI Newsletter, Former Idaho Governor Andrus Sues DOE.

[134] ICP-EXT-05-00784, Final Report for the Waste Area Group 7 Probing Project, May 2005, Pg.4.

[135] Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, June 2000, Pg. 11-12.

[136] DOE-ID-11389, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals Revision 3, Oct 2014, DOE-ID-11389.

[137] EGG-WM-8296, EXECUTIVE SUMMARY OF THE EG&G IDAHO BURIED WASTE PROGRAM RETRIEVAL PROJECT October 1988, EGG-WM-8296.

[138] Robert Alvarez, CBO Cost Estimation of Nuclear Modernization Omits Hazardous Cleanup, High-level radioactive waste pose threats to environment around nuclear management facilities, December 20, 2017, *Washington Spectator* https://washingtonspectator.org/alvarez-nuclear-cleanup/

A legal issue arises with RCRA statues when any listed mixed radioactive and hazardous waste site is remediated it must be treated as a new waste and not left in an unpermitted RCRA dump. As previously reported above and must be emphasized, the RWMC does not even qualify as an EPA Sub-Title D municipal waste dump much less a mixed radioactive hazardous Sub-Title C hazardous waste dump. Basically, this means DOE must remove all mixed radioactive and hazardous waste (including contaminated soil) it encounters with the retrieval project (ARPs) regardless what sweetheart deal it has cut with IDEQ and EPA on the grossly narrow "Targeted Waste Retrievals."

To show how the 2008 Agreement to Implement requires operators to go in to the pits/trenches and sort waste demonstrates how DOE cannot avoid calling all the waste "new" and thus under the EPA/NRC Land Disposal Regulations. Discussed more in Section IX below. Moreover, all the waste (as documented above in Section IV above) in the SDA is comingled with RCRA listed hazardous materials and soil. Appendix F "Protocol Waste Retrievals and For Targeted Volume Determinations" stipulates:

> "This Protocol describes procedures used in the field by the operators of the retrieval projects to conduct excavation, waste identification, retrieval and segregation.
>
> "SUMMARY:
>
> 'The approach taken in the field involves sectioning a defined pit area into grids for tracking purposes. Operators excavate and sort through all of the material in each grid with an excavator before moving to another grid area. The lateral extent of the excavations is defined in Appendices D and E of the Agreement. The vertical extent of excavation will go down as steeply as possible without compromising slope stability until basalt bedrock is reached, underburden is encountered or further excavation is not warranted based on safety, national security or practicability considerations. Waste material encountered during excavation is visually identified by a Retrieval Specialist as Targeted Waste or non-Targeted Waste. This observation is logged onto form FRM-196 for record and comparison purposes. Targeted Waste is placed in trays and processed through the Drum Packaging Station (DPS) where it is further examined to remove any Waste Isolation Pilot Plant (WIPP)-prohibited items. The waste is then placed in a container for characterization to meet WIPP or other appropriate facility requirements. Non-Targeted Waste is staged for potential placement back into the pit." [139] [emphasis added]

There is a perverse incentive for workers under DOE instructions to minimize waste retrieved in order to limit WIPP shipments to 7,485 cubic meters. [140] But wait, DOE built a large RCRA permitted CERCLA dump just 10 mi. up the road from RWMC beside INTEC on the INL, why not send the exhumed mixed hazardous non-TRU waste there? Good question! Follow the money. Spending $10 trillion Building the next generation of nuclear weapons is the priority not cleanup.

"The "best" historical estimates of TRU-contaminated soil volumes associated with buried TRU wastes are probably those given in DOE (1988a) as follows: Hanford (40,000 cm); INEEL (56,600-156,600 cm)." [141] This TRU waste volume is completely ignored in the SDA retrieval program and that adds to the violation of the 1995 Settlement Agreement and long term hazard for contaminate migration into the underlying aquifer.

Protocol for Targeted Waste Retrievals

Thanks to EPA's Wayne Pierre back in the 1980s when EPA was more willing to uphold the law, DOE was forced to conduct probes of the SDA to better characterize what was buried and where. Though the probes

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139 Agreement to Implement , U.S District Court Order Dated May 25, 2006, Attachment F, Protocol Waste Retrievals and For Targeted Volume Determinations, Pg. 1.

140 Ibid., Agreement to Implement, Section V. TRANSURANIC RETRIEVAL VOLUME, Pg. 5.

141 Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, June 2000, Pg. 14

did not cover enough of the SDA as was hoped, it did show significant areas not under any of the 8 ARPS. The ARPS [retrieval structures] are an excellent way to access buried waste, such tight restrictions (**6,238 m3** of targeted waste) that forced workers to leave nearly all (90%) but the (10%) targeted waste.

As discussed in Section V above, detecting TRU Waste in the Pits and Trenches is extremely difficult given the way it was dumped and co-mingled with mixed hazardous waste. DOE's bogus claim that trained workers working from remote video can distinguish waste classification is patiently absurd. DOE's own reports document just how difficult distinguishing waste types- especially TRU waste is:

> "To achieve adequate detection sensitivity, the distance of the alpha detector from the dig face cannot be more than a few inches. The closer the detector to the soil the better the alpha detection. However, the distance will be limited by the scanner's ability to position the detector next to the irregular surface of the face. Considering this restriction on distance, instrument sensitivity must be as high as possible or detection of alpha particles might not be made." [142]
>
> "Real-time radiography is required to determine the contents of intact barrels or boxes. The degree of uncertainty in the nuclear assay system's measurement ability to define whether waste is low level or TRU waste depends on some knowledge of the mixture of waste in the waste container being assayed. Specific items to be measured/detected are metals, liquids, pressurized bottles or cylinders, explosives, packing material, container integrity, etc... [pg18]
>
> "The nuclear assay system measures the amount of fissile nuclear material in a waste container. Neutron interrogation of the container for fissile materials that generate fast neutrons has the problem that some materials in the package, or the plywood package itself, thermalize the fast neutrons. Best results are obtained with waste made up of hard objects. Plastics materials and sludge cause a lot of uncertainty. At the [RWMC] SWEPP facility, the type of material mix in a box is defined best by knowing from base line data what was placed in the barrel and then verify the contents by X-ray real time radiography." [143] pg.30 [Emphasis added].
>
> "Waste characterization requires exhaustive spectrum analysis of waste packages. Best results are obtained when measuring homogeneous waste. Detecting plutonium requires, as a minimum, a high-energy neutron radiography facility capable of scanning the waste under precisely controlled conditions and configuration. It appears that more studies of the technique and instrumentation to characterize waste need to be done to allow finalization of the assay system location in the waste stream and functional design." 144

Despite the above discussion on the difficulty of remote pit-face waste classification, DOE claims the operators of the retrieval project using remote video are adequately determining what waste stays in the excavation and what is retrieved. Pressure to limit waste extracted overrides appropriate classification. This is the fundamental project protocol flaw.

> "This Protocol describes procedures used in the field by the operators of the retrieval projects to conduct excavations, waste identification, retrieval and segregation." "As the excavator identifies a drum, whether that drum is intact or partly disintegrated, the drum will be breached for safety reasons to ensure that inadvertent releases do not occur near personnel. Once the drum is opened, the waste is visually identified as either Targeted or non-targeted waste. Where trained personnel can visually identify (through video) whether the waste is targeted or non-targeted, the contents of the drum will be emptied into a tray or returned to the pit, as the case may be." [145] [Ibid. pg. 1&2 Appendix F]

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[142] EGG-WM-8296, pg. 18.
[143] EGG-WM-8296, pg. 30.
[144] EGG-WM-8296, pg. 30
[145] EGG-WM-8296, Sec. 1&2 Appendix F

Section VII. Deficiencies in the Accelerated Waste Retrieval Project

Above we discussed the difficulty in legitimately identifying TRU waste and the innumerable efforts DOE is in doing to violate previous commitments to the State of Idaho, WPEIS, etc., so now we look at just what has been done. The current position as of the writing, DOE is nearly done with waste extraction under CERCLA cleanup at the RWMC. All that remains is ARP VIII & X and maintaining subsidence in the cover and institutional control for 100 years.

> "OU 7-13/14, the comprehensive remedial investigation and feasibility study for the RWMC, is the <u>final operable unit planned under CERCLA</u> and implemented under the Federal Facility Agreement and Consent Order for Waste Area Group 7. [pg. iii] [146] [emphasis added]

Early retrieval should have been sufficient indication that limited "targeted retrievals" would be insufficient especially because of the underlying contaminated soil. The process is fundamentally flawed in terms of accomplishing the legal goal of remediation and removing all RCRA listed hazardous waste. Targeted selective retrieval just is NOT meeting the legal RCRA requirements.

> "The 1977 Early Waste Retrieval Project also included peripheral studies related to buried-waste retrieval. A TRU isotope migration study (Humphrey and Tingey 1978) indicated that contaminant migration (Pu-238, -239, -240 and Am-241) from waste was limited to a distance of approximately 0.6 m (2 ft), but trace contamination as far as 1.8 m (6 ft) was found. <u>Part of this migration may have been caused by historical flooding</u>. [3-18]
>
> "September 1978. The project retrieved 137 55-gal drums and approximately 65% of drums were breached. These drums had many rust holes, and several fell apart as they were being retrieved. <u>About 3% of retrieved drums leaked free liquid with alpha-contamination levels ranging from 2,000 to 80,000 cpm</u>. Many drums had fixed alpha contamination on their external surfaces that ranged from 2,000 to greater than 2E+06 cpm. One drum had radiation levels to 300 mR/hour at contact. Retrieved loose waste was partially contained in deteriorated wooden boxes. <u>Alpha-contamination levels on the loose waste ranged from 4,500 to 2E+06 cpm.</u> Loose waste, including metal cylinders and glass vials, exhibited beta-gamma contamination. An analysis of contamination in Trench 7, including the liquid in vials, indicated Sr-90 and Cs-137 to levels of 200 mR/hour. Approximately 4.9 m3, or 17% of the retrieved volume excluding self-generated waste comprised alpha- and beta-contaminated soil. The volume of self-generated waste from retrieval operations was 4.3 m3 or 15% of the retrieved waste volume.
>
> "During the 1978 retrieval, 457 drums were retrieved with a volume of 94.5 m3. Retrieved loose waste and contaminated soil amounted to 34.4 and 24.3 m3, respectively. The self-generated waste from retrieval operations was 17.2 m3." [147] [3-19] [emphasis added]

An exemplar of how inadequate DOE's waste retrieval characterization process is the following:

> "The U.S. Department of Energy in a statement April 12, 2018, says the waste barrel breach occurred at INL. A barrel containing radioactive sludge ruptured at an Idaho nuclear facility, federal officials said, resulting in no injuries and no risk to the public but possibly slowing progress in shipping waste out of the state.

- The U.S. Department of Energy said the 55-gallon (208-liter) barrel ruptured late Wednesday at the 890-square-mile (2,305-square-kilometer) site that includes the Idaho National Laboratory, one of the nation's top federal nuclear research labs.
- The rupture triggered a fire alarm, and three Idaho National Laboratory firefighters extinguished the smoldering barrel and pulled it away from a dozen other barrels nearby.
- When the firefighters left the building, emergency workers detected a small amount of radioactive material on their skin, said department spokeswoman Danielle Miller.

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[146] ICP-EXT-05-00784, pg. iii

[147] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007

- The material was washed off the firefighters, who were taken to a nearby medical facility as a precaution, she said.
- Initial assessments showed they did not inhale the radioactive material and were not injured, Miller added.
- None of the radioactive material was detected outside of the building where the rupture occurred, she said.
- Federal officials said it's the first known rupture of a barrel containing radioactive sludge at the site but might not be the last.
- That's because secretive record-keeping during the Cold War makes it hard for officials to know the exact contents of similar barrels, said Idaho National Laboratory Joint Information Center spokesman Don Miley.
- The barrel contains a mixture of fluids and solvents that came from nuclear weapons production at the Rocky Flats Plant near Denver.
- Officials during the Cold War were extremely secretive about the contents of the barrels for fear that the process of making nuclear weapons could be revealed if the contents were known, Miley said.
- A preliminary theory about the cause of the rupture is that radioactive decay made the barrel heat up and ignite particles of uranium, he said.
- "They haven't run into anything like this actually happening," he said. "They've got a really good idea of what's in (the barrels), but they might not always know the concentrations."
- He said an investigation will try to determine if there are other barrels at risk of rupturing.
- Workers entering the structure, even before the breach, must use self-contained breathing apparatus and wear full protective clothing. Officials said no radiation has been detected outside the structure, which has special filters to prevent radioactive particles from escaping.
- It's not clear how many barrels are in the earthen-floor structure that's 380 feet (116 meters) long and 165 feet (50 meters) wide. The barrel that ruptured had been moved to the containment structure in preparation for shipment to the Waste Isolation Pilot Plant near Carlsbad, New Mexico.
- At the underground repository in 2014, a barrel of radioactive waste ruptured after being inappropriately packed at Los Alamos National Laboratory, another of the nation's nuclear research labs. The waste had been mixed with organic cat litter to absorb moisture, resulting in a chemical reaction.
- The incident resulted in a radiation release that forced the closure of the repository for nearly three years and prompted an expensive recovery effort and a major policy overhaul for handling Cold War-era waste.
- The sprawling Idaho site in high-desert sagebrush steppe sits atop the giant Eastern Snake Plain Aquifer that's used by cities for drinking water and farmers for irrigation. The area is near the striking 7,550-foot (2,300-meter) Big Southern Butte, which has a road to the top for adventurous drivers.
- The site has been used for nuclear waste disposal and storage beginning in the 1950s. The federal government has been cleaning it up following court battles and several agreements with Idaho in the 1990s amid concerns by state officials that Idaho was becoming the nation's nuclear waste dump.
- The Energy Department has already missed several deadlines under those agreements involving moving nuclear waste out of Idaho and has paid about $3.5 million in fines.
- Idaho is also preventing research quantities of spent nuclear fuel from entering the state to be analyzed by Idaho National Laboratory scientists due to a missed deadline.
- The federal agency also faces deadlines concerning waste stored in barrels, and the radioactive release and investigation could slow the process of moving that waste out of state.
- The Energy Department has floated the idea of bringing in more nuclear waste from Hanford in Washington state for treatment at a $500 million facility at the Idaho site.
- Idaho Attorney General Lawrence Wasden on Thursday declined to comment on the situation.
- Wendy Wilson of the Snake River Alliance, an Idaho-based nuclear watchdog group, said the incident is a reminder of why the state should not allow more nuclear waste to be shipped into Idaho for treatment.
- "It sure demonstrates how much things can go wrong when you're dealing with waste that hasn't been fully assessed," she said." [148]

[148] *Investigation Involving Waste Drum Continues at DOE Idaho Site*, Apr 18, 2018, KPVI News. https://www.kpvi.com/news/local_news/investigation-involving-waste-drum-continues-at-doe-idaho-site/article_7eeb613a-4359-11e8-b4c4-c7feb788b2df.html

Non-targeted waste was returned to the SDA pit when it should have been treated and disposed in a permitted Subtitle C mixed hazardous/radioactive facility available just a couple miles up the road at INL CERCLA Facility.

"In general, nontargeted waste is returned to the excavation. Retrieval specialists are trained to visually discriminate targeted from non-targeted waste using protocols established in TPR-7420 and GDE-318. Based on historical shipment data, the following non-targeted waste streams are present in ARP retrieval areas:

Series 744 sludge: This sludge, also referred to as special setups, contains inorganic and organic liquids stabilized with Portland cement since they were incompatible with Rocky Flats Plant wastewater or organic waste treatment processes.

Series 745 sludge: This sludge is comprised of nitrate evaporator salts resulting from Rocky Flats Plant recovery plutonium processes. [Sec. 3.2.8]

"Miscellaneous Rocky Flats Plant sludge: This miscellaneous sludge was shipped from Rocky Flats Plant Building 444 and is either VOC waste residue from a distilling process or sludge resulting from uranium oxides and residual heat-treating salts.

"Non-Rocky Flats Plant sludge: This is sludge shipped from TAN-607, CFA-654, and NRF-618. The Test Area North and Central Facilities Area sludge is sewage sludge and the Naval Reactors Facility sludge is described as evaporator sludge bottoms.

"Beryllium waste: This waste is identified from the Rocky Flats Plant and categorized as beryllium waste, but it is unclear whether this was beryllium metal or other materials contaminated with beryllium.

"Line-generated waste: This is waste that contains various materials removed from the plutonium-processing glove boxes, including items such as glove box gloves and combustible waste.

"Combustible debris: This is waste comprised of paper, plastic, wood, and other combustible materials.

"Noncombustible metal debris: This is waste that is predominantly metallic. [149] [Pg. 60]

"ARP VI—Twenty-eight nontargeted waste samples were planned for ARP VI. The sample from -Grid ZP-1 (Figure 48) was not taken because of the shallow depth at that location. In addition, only one of two planned underburden core samples was acquired. Because waste in Grid ZP-5 did not match the recorded physical description for waste expected at that location, the planned underburden core sample was not collected, in accordance with the Field Sampling Plan. (PLN3690). [pg68]

"Section 4. Most of the retrieved waste is sent to WIPP. Idaho CERCLA Disposal Facility waste acceptance criteria (DOE-ID 2013b) apply to waste streams sent there for disposal (e.g., CERCLA secondary waste); however, targeted waste is not disposed of at the Idaho CERCLA Disposal Facility or other INL Site facility. All targeted waste is shipped out of the State of Idaho. Secondary waste was disposed of in the pit, as previously discussed. [150] [pg57]

When the "Accelerated Retrieval Project" actually exhumes waste for shipment for WIPP it works reasonably well. There were earlier problems when waste was removed and packaged some barrels caught fire because operators were not required to consider "reactive waste." [151]

"Non-TAU-contaminated waste pits and trenches. Track 1 RWMC-04 The Track 1 investigation (EG&G 1993a) evaluated existing data for three of 18 pits, 26 of 58 trenches, and none of the SVRs. Potential unacceptable risks were identified for multiple radioactive and nonradioactive constituents." [Pg. 3-34]

"10.2.2.9 Underburden Sampling. [Underburden = contaminated soil under the waste pit/trench] The core sampling performed was intended to characterize contaminants of interest in the underburden and to support subsequent evaluations of the potential for contaminant migration.

"Results in the Remedial Action Report (DOE-ID 2004b) confirm that the presumed underburden contains high levels of TRU contaminants with two subsamples exhibiting Pu-239 concentrations greater than 100 nCi/g. Preliminary evaluation of the relative abundance of TRU elements within these subsamples suggests that this contamination most

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[149] DOE-ID-11396, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals October 2014, Rev 3 DOE-ID-11396.

[150] DOE-ID-11396, pg.57.

[151] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002.

likely resulted from mixing of waste and underburden soil during waste retrieval. Variations in the relative abundance of Pu-239 and Am-241 from subsamples are suggestive of chemical transport processes." [152] [Pg.10-25] [emphasis added]

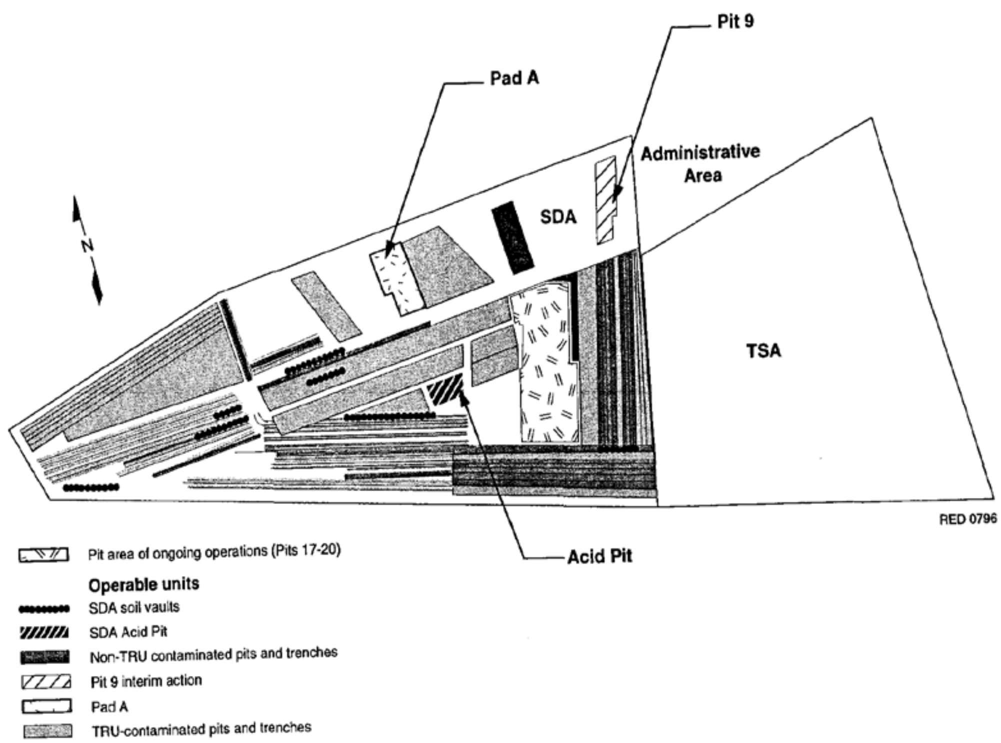

Figure 1-2. Overview layout of the Radioactive Waste Management Complex, including the Subsurface Disposal Area, Transuranic Storage Area, and Administrative Area.

Figure 1-2 above: A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste Buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983 Volume 1 INEL-95/031 0, (Formerly EGG-WM-1 0903) Rev. 1 August 1995, Pg.1-5.

The importance of the Figure 1-2 above shows how extensive TRU waste is distributed in the SDA pits and trenches that radically contrast the current DOE characterization of limited TRU waste for "retrieval." Between 1950 and 1977 when TRU waste >10 nCi/g) was segregated to above ground "storage" pads covered with soil, waste shipments to RWMC/SDA were dumped randomly into whatever pit/trench was open at the time. Large items like reactors or big tanks were dumped in pits, while small loads of barrels went into trenches. Attachment A to this report offers more details on this issue.

[152] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007

Section VIII. Fire Hazards in SDA Hazardous Waste Problems

The issue of fires in the SDA waste demonstrates how extremely hazardous/reactive the waste is and how inadequate the DOE characterization of the waste is and why it's essential to remove all RCRA listed hazardous wastes from the SDA. DOE even brags about its CERCLA [153] Subtitle C mixed hazardous/ radioactive waste dump that is a "**39-acre** disposal facility designated for CERCLA waste with lined evaporation ponds and treatment, storage, and administrative facilities designed to safely contain contaminated soil and cleanup debris." [154] This facility is located on the INL site just 9 mi. up the road from the RWMC. So there is no rational excuse for not treating EPA listed "ignitable/reactive" waste and not moving all the SDA buried mixed hazardous/radioactive waste that does not qualify for WIPP to the INL CERCLA facility or other permitted offsite disposal facilities currently used by DOE. But of course it costs more and Idaho's future water is not a DOE priority.

DOE's Phase I RWMC Targeted Waste Report shows sparks during retrieval operations. "Drum Fire: On November 21, 2005, during exhumation of 3.1.2.1 waste in ARP I, an apparent deflagration occurred during retrieval of a drum from Grid I-2 (Figure 38). The equipment operator sprayed water on the smoldering material and smothered it with soil in accordance with procedures (ICP 2006). The facility was placed on standby status and an investigation ensued to confirm the nature of the drum fire and to augment procedures to address future occurrences." [155]

Tami Thatcher offers a different perspective on the above SDA fire accident in an article titled "Several Barrels of Waste Over-pressurize Within Hours After Being Repackaged at the Idaho Cleanup Project ARP V [accelerated retrieval project)."

> "On April 11, a barrel of waste ruptured just hours after the waste was examined and put into a new barrel. The lids also blew off three other recently repackaged drums. The fire department responded to an alarm at the facility. The firemen were wearing breathing apparatus when they entered the ARP V enclosure. Minor skin contamination was reported. Fluor reported that no injuries or environmental contamination were caused by the event. [156]
>
> "The drum rupture and several lids popping off other drums occurred while no one was working in the enclosure. But if the accident had occurred during normal working hours, workers near the drums would not have been wearing breathing apparatus. The inhalation of radioactive material, which is strongly retained in the body, could have yielded significant adverse health effects including the increased risk of cancer even if workers appear to be relatively unharmed.
>
> "The accident occurred at the Idaho Cleanup Project Accelerated Retrieval Project (ARP) V. ARP V is a temporary structure built over a portion of the burial grounds at the Radioactive Waste Management Complex. The exhumation of a portion of the buried waste at ARP V, called "targeted" waste which is chemically-laden waste from the Rocky Flats weapons plant, had been completed and now ARP V was being used for repackaging sludge barrels stored at the Advanced Mixed Waste Treatment Project.
>
> "The waste in the drums that over pressurized is probably from the Rocky Flats weapons plant. The waste is thought to have been buried in the 1960s and exhumed in the 1970s. The barrels of waste had been stored in cargo containers

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[153] Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1986, as amended by the Superfund Amendments and Reauthorization Act, the National Oil and Hazardous Substances Pollution Contingency Plan is the U. S. Congress' response to huge environmental contamination sites. Subsequently, Congress passed the Federal Facility Compliance Act that forced government agencies (like the DOE) to comply with these environmental laws via legally enforceable Consent Orders. Unfortunately our current Congress has lost that original leadership.

[154] Idaho Site Cleanup By the Numbers

[155] Phase I RWMC Targeted Waste Report, pg. 49.

[156] Keith Ridler, *The Idaho Statesman*, "Officials say radioactive sludge barrel ruptures now total 4," April 25, 2018. http://www.idahostatesman.com/latest-news/article209827149.html

until recently brought to ARP V's earthen floor temporary building for repackaging. While the barrels of waste are likely from Rocky Flats, there has not yet been confirmation to determine the source of the waste or the contents of the barrels.

"No sparks were seen when the waste was emptied from the old barrel in a glove-box-like structure. Chunks of burning uranium are expected due to the pyrophoric nature of uranium (and plutonium). No sparks or flames were noted and no large items were found. The waste was treated routinely and put into new barrels. Thousands of sludge barrels have been packaged at ARP V.

"Barrels of waste from Rocky Flats came with some recordkeeping for each shipment of barrels. But the barrels were dumped into unlined pits and there were no identifying labels on the barrels. Gallons of chemical "sludges" were often in the barrels of waste from Rocky Flats.

"So, why did decades-old-waste heat up and over-pressurize four waste drums within hours of being repackaged? Hydrogen gas and other gases can build up in the presence of ionizing radiation. **The specific chemicals present in the barrel can each have a different propensity to generate hydrogen in the presence of ionizing radiation. Not only can that, mixing the chemicals yield an enhanced propensity to generate hydrogen gas and other gases.**

"The need for venting drums has long been studied and have long been recognized to be a safety issue for storage and transportation of waste drums. According to a study published in 2000, [157] "Radiolytic generation of hydrogen occurs when ionizing radiation (e.g., [alpha, beta, or gamma]) interacts with hydrogenous materials. The metric for hydrogen generation from a particular material undergoing radiolysis is the G-value, which has units of molecules of gaseous hydrogen product per 100 eV of radioactive decay energy absorbed." The 2000 study lists G- values for various chemicals but notes that when certain chemicals are combined, the G-values can be increased.

"The amount of plutonium and/or uranium in the waste cannot be accurately estimated because unless the entire contents in analyzed pinch by pinch, the actual concentrations and total curie amount is not actually known.

"In study of uranium and the dependence of the size of the uranium pieces or powder, it has been observed that dispersed fine uranium powder would require higher ignition temperatures than larger pieces of uranium. **This indicates that finer particles of uranium would be less likely to spark when in the open trough for examination. But, conversely, the fine uranium powder would ignite at lower temperatures when packaged in a barrel.** [158]

"Apparently, there was no monitoring of the hydrogen gas buildup after repackaging the waste. So, while the hydrogen gas buildup was occurring within hours, rather than weeks or months of storage, Fluor had assumed that the waste would behave as previously repackaged barrels of waste had. And Fluor assumed this despite not actually knowing what chemicals or combinations of chemicals were present in the drum.

"The local Department of Energy, Idaho and Idaho Cleanup Project contractor Fluor are planning to conduct an investigation to determine the cause of the accident. But, the decision to not have an investigation led by DOE Headquarters or other independent entity is, I believe, a mistake.

"There may be the temptation to avoid responsibility for any mistakes made that might reduce Fluor's award fee. There would also be the temptation for the local DOE-ID who approved current work processes as safe to seek a return to production in the most rapid and least cost approach which may leave safety issues unresolved. The managers at the Waste Isolation Pilot Plant (WIPP) in New Mexico should require the Department of Energy Headquarters to lead the accident investigation before this waste packaging is resumed, transported, and accepted by WIPP. Idaho's Department of Environmental Quality rubber stamped its approval of vastly increased RCRA mixed waste (chemical and radioactive transuranic waste) at the

[157] B. L. Anderson et al., Hydrogen Generation in TRU Waste Transportation Packages, NUREG/CR-6673, UCRL- ID-13852, Lawrence Livermore National Laboratory, February 2000, https://www.nrc.gov/docs/ML0037/ML003723404.pdf p. 77 "Aromatic hydrocarbons, such as benzene, toluene, and cyclohexene protect TBP from radiolysis, while saturated hydrocarbons such as hexane, cyclohexane, and dodecane sensitize TBP to radiolytic degradation (Barney and Bouse 1977). Carbon tetrachloride has also been found to sensitize TBP radiolysis."

[158] M. Epstein et al., Fluor Hanford, "Uranium Pyrophoricity Phenomena and Prediction," SNF-6192-FP, April 2000. https://www.osti.gov/servlets/purl/803044

> Idaho National Laboratory's Materials and Fuels Complex last year DOE's vague statements about fire protection for the transuranic waste. [159] [160]

Limits of up to 400 grams of U-235, or 267 grams of Pu-239 that could be disposed in the same container were exceeded. [161] [PR-W-79-038 @30] Two fires in Trench 42 occurred on September 8 and 9, 1966, and were caused by alkali metals being mixed with low-level waste. This was coupled with a 34% increase in "hot" waste in the trench. [Ibid] A third fire occurred on June 1, 1970 when sunlight on an exposed drum of uranium turnings ignited. The fire spread to other drums and "attempts failed to extinguish the fire in the waste stack." [Ibid @44] The fire was finally contained by a bulldozer operator who covered the stack with ground. Also see "Nuclear Criticality Safety Issues Pertaining to the INL SDA." [162]

Fires in the SDA pits have plighted the dump for decades. Two fires in Trench 42 occurred on September 8 and 9, 1966, and were caused by alkali metals being mixed with low-level waste. This was coupled with a 34% increase in "hot" waste in the trench. [Ibid] A third fire occurred on June 1, 1970 when sunlight on an exposed drum of uranium turnings ignited. The fire spread to other drums and "attempts failed to extinguish the fire in the waste stack." [163] [Ibid. Pg. 44] The fire was finally contained by a bulldozer operator who covered the stack with ground. [164]

Another exemplar of the above nuclear criticality issues and how pyrophoric/hazardous the buried waste is DOE's found in Phase I RWMC Targeted Waste Report [pg.49] that shows sparks during retrieval operations.

> "Drum Fire. On November 21, 2005, during exhumation of 3.1.2.1 waste in ARP I, an apparent deflagration occurred during retrieval of a drum from Grid I-2 (Figure 38). The equipment operator sprayed water on the smoldering material and smothered it with soil in accordance with procedures (ICP 2006). The facility was placed on standby status and an investigation ensued to confirm the nature of the drum fire and to augment procedures to address future occurrences." [165]

Still another exemplar of how inadequate the waste hazardous waste retrieval characterization of barrels already retrieved/assessed and repackaged for shipment to WIPP is the following DOE contractor press release. "Four 55-gallon drums of radioactive waste ejected their lids due to excessive pressure on April 11 at the Accelerated Retrieval Project No. 5 (ARP 5) facility, Idaho Site cleanup contractor Flour Idaho confirmed." [166] "The U.S. Department of Energy in a statement Thursday, April 12, 2018, says the waste barrel breach occurred at INL. A barrel containing radioactive sludge ruptured at an Idaho nuclear facility,

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[159] Thatcher, Tami, Environmental Defense Institute Special Report, "Public Comment for Class 2 RCRA Permit Modification for Materials and Fuels Complex," 2017. www.environmental-defenseinstitute.org/publications/EDIRCRAcomments2017.pdf

[160] Thatcher, Tami, Several Barrels of Waste Over pressurize Within Hours After Being Repackaged at the Idaho Cleanup Project ARP V, May 2018 EDI Newsletter. http://environmental-defense-institute.org/publications/News.18.May.pdf

[161] PR-W-79-038; A History of the Radioactive Waste Management Complex, at INEL, September 1979, EG&G Idaho, Pg. 30

[162] Nuclear Criticality Safety Issues Pertaining to the INL SDA, J.A. McHugh, R.A. Knief, and M.A. Bobkin, May 3, 2000. This report offers much more details about the chronic criticality issue.

[163] PR-W-79-038, Pg. 44

[164] Broscious, Chuck, Citizens Guide to INL, offers a history of nuclear mismanagement of waste disposal. http://environmental-defense-institute.org/publications/GUIDE.963.pdf

[165] DOE/ID-11396, Phase I Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, Pg. 48-49.

[166] https://www.exchangemonitor.com/four-waste-drums-breached-inl-says-fluor-idaho/

federal officials said Thursday, resulting in no injuries and no risk to the public but possibly slowing progress in shipping waste out of the state.” [ibid.] This accident is discussed more in Section V below.

J. A. McHugh, et.al., writes in a revealing 2000 report titled *Nuclear Criticality Safety Issues at the SDA about crucial steps that DOE/ Bechtel must take to prevent criticality events*.

> “No conclusive evidence has been presented (to date) that places the future risk of nuclear criticality in the SDA at an insignificant level. The DOE and Bechtel must complete a comprehensive nuclear criticality safety assessment to support current and future actions in the SDA and Pit 9.”
>
> “Since characterization data are extremely limited or nonexistent, best estimate information must be gleaned from Rocky Flats Plant (RFP) historical waste records (which do not appear to be a reliable source) or the RFP assessments of quantities shipped off-site for disposal. If one developed a best estimate (with uncertainties) relative: to the amount, distribution, and nature of the Pu waste, it might be possible to encompass all likely future histories with bounding scenarios. If a best estimate of the defining parameters cannot be developed with historical information, then it will be necessary to physically characterize the Pu distribution in the SDA. [pg1]
>
> **“GENERAL ISSUES**
>
> “Nuclear criticality safety in waste disposal sites differs somewhat from other nuclear safety problems in that exact quantities and locations of the fissile material are not well known. The disposal of Pu, U, Am and Np wastes from the Rocky Flats Plant (RFP) was not controlled by adequate administrative and engineered safeguards. Generally, waste disposal involves small quantities of discarded fissile material, and nuclear material control and accountability requirements provide adequate safeguards to avoid significant accumulations. However, the controls placed on waste from the RFP are not consistent with current standards. Disposal of single items that contain significant quantities of fissile material has occurred. This presents current issues and future concerns which include:
>
> “1. There is potential for interaction among waste units and surrounding neutron-reflecting materials. Evaluation of waste disposal records and practices, coupled with preliminary Stage I Results, suggest fissile material "hot spots" exist within Pit 9 and the SDA. If the distribution of Pu and other fissile nuclides were uniform and in a stable geometry, throughout the: waste volume, sub-criticality would be assured. However, the presence of localized "hot spots" is a significant concern.
>
> “2. The evaluation of RFP waste disposal practices, packaging, and assaying suggests that Pu "hot spots" are highly likely. Significant quantities of Pu and other fissile materials exist in Pit 9 and the SDA. Single 55-gallon drum loadings of> 1 kg (with a potential for 2.9 kg) is possibilities within the Pit 9 waste volume. An estimate of a total of 27 to 40 kg of Pu 239 in Pit 9 has been stated as a reasonable expectation. Also, an estimate of 1000 kg Pu 239 for the SDA has been stated as a reasonable expectation. In neither location is the distribution of drums well characterized.
>
> “3. A drum loading of about 3 kg (a rough upper bound estimate for a graphite mold waste drum), distributed uniformly over the 55-gallon drum volume, would have a Pu concentration of about 15 g/liter. This Pu mass, if homogeneously distributed in water throughout the drum volume, could be critical even if unreflected. <u>The minimum critical mass of about 500 g Pu in water is approached with a spherical volume only 10-20% of that of the 55-gallon drum with water reflection. Heterogeneous distribution of plutonium in water would raise the minimum critical mass. A 55 gallon drum containing greater than or equal to 1 kg of Pu waste can be a significant criticality safety issue depending on the waste form, matrix stability, packaging geometry, and container integrity</u>. The behavior of each such drum requires careful attention with respect to long-term concentration and redistribution mechanisms.
>
> “4. Graphite, and possibly beryllium, are not present in the quantities and purity to reduce the Pu minimum critical mass. However, they may contribute to reflection (better reflectors than water and other hydrogenous materials).
>
> 5. “Other fissile nuclides (i.e. U 235) and fissile transuranic nuclides (i.e. Am 241, Np 237) are present in Pit 9, in addition to the isotopes of Pu. The distribution within waste volumes and mixture characteristics are not known for this RFP waste. These data are important for a complete nuclear criticality safety assessment.
>
> “6. <u>Subsurface processes, which, for example, could result in substantial geometry changes, as well as inherent changes in neutron moderation, are not understood for this RFP waste disposal area. Therefore, the long-term geometric stability of the fissile material configuration in the waste cannot be guaranteed. Subsidence events, water infiltration, waste decomposition, displacement, aggregation and separation processes will occur. Each can directly affect the nuclear criticality potential</u>. [Pg. 2]

"7.The accountability and NDA [standard] methods used in the 1960[1]s time frame to determine or estimate the fissile content of waste are not accurate by today's standards. Considerable uncertainty exists in the stated amounts of Pu and other fissile material in the RFP waste containers. The result is that the current Pit 9 (and the SDA) inventory information (i.e. the fissile nuclides and their quantities, distribution, mixture types, concentrations, etc.) makes it difficult to assess nuclear criticality safety.

"8. The fissile material forms are significantly more dense than typical waste constituents. This physical property presents opportunities for accumulation or separation by physical and chemical processes within the waste volume, especially when one considers time frames of 100's to 1000s of years.

"**SPECIFIC ISSUES**

"Appendix A of the PSA [Probability Safety Analysis] presents probability distributions for Pu and Am-241 in waste drums stored at the INEEL. These distributions are intended to be used in some way to support the PSA. These distributions are pertinent to RFP waste generated in a time frame very recent, as compared to the wastes in the SDA pits and trenches. It appears that significant differences in waste packaging and attention to recovering Pu waste materials occurred between the early era (i.e., 1950s to 1960s) and the later era (1970s on). Therefore, using these data for Pu and Am distributions within the SDA and Pit 9 will not yield appropriate radiological and criticality risks.

"A review of historical Rocky Flats Plant information on Pu losses to burial (DEK-04-94 Letter) indicates that a number of Pu significant waste forms were sent to the INEEL SDA. For example, the first and second stage prefilters from Building 771 contain significant amounts of Pu; the destructive analysis results for these filter types averaged 300 grams per filter. To estimate quantities that likely went to burial, a value of 200 grams per filter was used.

"Considering the measured average was 300 grams, one could expect some filters to contain amounts significantly greater than 300 grams. Release of material from the filter media and the long-term chemical stability of the filter media are important issues that must be addressed in nuclear criticality analyses. Also, a detailed understanding of how this waste type was packaged and prepared for disposal in the 1950s, 1960s, and 1970s is necessary. Heavily loaded prefilters pose significant risks relative to criticality because of matrix structure, mechanically trapped Pu particles, and the fact that reasonable mechanisms exist to accumulate Pu quantities of concern. [Pg. 3]

"CRITICALITY SCENARIOS

"A criticality evaluation must not be restricted to the short-term, but must focus on the long-term probability of assembling sufficient fissile material in a location of the waste disposal area to present an unacceptable risk to future site workers or occupants. One must consider both short and long-term processes that involve the fate, transport and/or concentration of Pu. Also, the natural occurrences that take place within this type of landfill must be evaluated long-term. A few examples are:

Current Time Frame (l0's of years)

"1. Subsidence of high concentration waste into void spaces after corrosion failure of barrels, or disintegration of other container types. Concentration reaches critical.

"2. Inadvertent flooding in-situ increases reactivity of waste to critical in one, or an adjacent group of drums/containers with a high concentration of fissile material.

"3. Inadvertent flooding after failure of drums and subsidence of high-level fissile waste increases reactivity to critical.

"Extended Time Frame (100 years)

"1.Decay and disintegration of organic components of waste. Biologic degradation of all organic solvents. Corrosion disintegration of all drums/containers. All soluble components of waste transported away from pit. Fissile material (heavy metal oxides) remains insoluble. Resulting compaction of fissile material. Water present to provide increase in reactivity.

"2. Change in climate and increase of vegetation at pit. Generation of humic acids mobilize fissionable elements. Fissionable elements transported to location where conditions permit re-precipitation at a critical concentration. Scenario with and without disintegration, decay and elimination of all organic materials.

"Long Term (100s to 1000 years)

"Assumed loss of institutional control. No earlier remediation of pit. All hazard markers lost. Climate has changed to wetter summers and longer growing seasons. Ground water flow increased. Water table rises.

1. Further fissile waste added to pit to bring total to critical amount.

- Decay and disintegration of organic components of waste. Biologic degradation of all organic solvents. Corrosion disintegration of all drums. Disintegration of other container types. Organic materials are degraded, solubilized and lost. All soluble components of waste transported away from pit. Fissile materials remain insoluble. Resulting compaction of fissile material. Water present to provide increase in reactivity.
- All containers disintegrated. Waste exposed to surroundings. Change in climate or vegetation at pit. All organic waste is degraded and lost. Generation of chelating humic [sic] acids together with any surviving chelating agents mobilize fissionable elements. Fissionable elements transported to a location were conditions permit re-precipitation to a critical configuration.
- All waste exposed to surroundings. Pit used to dump acid. Non-fissile components solubilized and transported away by ground water. Residual fissile material concentrated to a critical configuration.
- All waste exposed to surroundings. Pit used to dump acid. All contents solubilized and transported away by ground water. Fissionable elements transported to location where conditions permit re-precipitation to a critical configuration.

"Alternative: Climate remains constant. INEEL in high desert dry condition. Loss of institutional control. No earlier remediation of pit. All hazard markers lost. Same scenarios as above case, except for scenario 3. Scenario 3 can be replaced by the assumption of agriculture at the INEEL site with other assumptions remaining. Irrigation provides water source to drive transport.

"These are some of the scenarios that can be postulated for the SDA situation. Some are more credible than others. However, all depend heavily upon the nature, amount and distribution of fissile material currently present in the disposal areas, and this needs to be the initial focus of a comprehensive nuclear criticality safety assessment.

"CONCLUSION

"No conclusive evidence has been presented (to date) that places the future risk of nuclear criticality in the SDA at an insignificant level. The DOE and Bechtel must complete a comprehensive nuclear criticality safety assessment to support current and future actions in the SDA and Pit 9. If an assessment addressing the current data with all of its uncertainty is unable to demonstrate that credible scenarios will lead to subcritical configurations, then actions must be defined to assemble or otherwise gather the data required to complete a valid assessment." [167] [emphasis added]

The waste incident of drum rupture and several lids popping off other drums thankfully occurred while no works were in the enclosure. But if the accident had occurred during normal working hours, workers near the drums would not have been wearing breathing apparatus. The inhalation of radioactive material, which is strongly retained in the body, could have yielded significant adverse health effects including the increased risk of cancer even if workers appear to be relatively unharmed. Tami Thatcher reports this accident below:

> "The accident occurred at the Idaho Cleanup Project Accelerated Retrieval Project (ARP) V. ARP V is a temporary structure built over a portion of the burial grounds at the Radioactive Waste Management Complex. The exhumation of a portion of the buried waste at ARP V, called "targeted" waste which is chemically-laden waste from the Rocky Flats weapons plant, had been completed and now ARP V was being used for repackaging sludge barrels stored at the Advanced Mixed Waste Treatment Project.
>
> "The waste in the drums that over pressurized is probably from the Rocky Flats weapons plant. The waste is thought to have been buried in the 1960s and exhumed in the 1970s. The barrels of waste had been stored in cargo containers until recently brought to ARP V's earthen floor temporary building for repackaging. While the barrels of waste are likely from Rocky Flats, there has not yet been confirmation to determine the source of the waste or the contents of the barrels.
>
> "No sparks were seen when the waste was emptied from the old barrel in a glove-box-like structure. Chucks of burning uranium are expected due to the pyrophoric nature of uranium (and plutonium). No sparks or flames were noted and no large items were found. The waste was treated routinely and put into new barrels. Thousands of sludge barrels have been packaged at ARP V.
>
> "Barrels of waste from Rocky Flats came with some recordkeeping for each shipment of barrels. But the barrels were

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[167] J. A. McHugh , *Nuclear Criticality Safety Issues Pertaining to the INL SDA*, , J. A. McHugh, R. A. Knief, and M.A. Robkin, May 3, 2000.

dumped into unlined pits and there were no identifying labels on the barrels. Gallons of chemical "sludges" were often in the barrels of waste from Rocky Flats.

"So, why did decades-old-waste heat up and over-pressurize four waste drums within hours of being repackaged? Hydrogen gas and other gases can build up in the presence of ionizing radiation. **The specific chemicals present in the barrel can each have a different propensity to generate hydrogen in the presence of ionizing radiation. Not only that, mixing the chemicals can yield an enhanced propensity to generate hydrogen gas and other gases.** [emphasis added]

"The need for venting drums has long been studied and have long been recognized to be a safety issue for storage and transportation of waste drums. According to a study published in 2000, [168] "Radiolytic generation of hydrogen occurs when ionizing radiation (e.g., [alpha, beta, or gamma]) interacts with hydrogenous materials. The metric for hydrogen generation from a particular material undergoing radiolysis is the G-value, which has units of molecules of gaseous hydrogen product per 100 eV of radioactive decay energy absorbed." The 2000 study lists G- values for various chemicals but notes that when certain chemicals are combined, the G-values can be increased.

"The amount of plutonium and/or uranium in the waste cannot be accurately estimated because unless the entire contents in analyzed pinch by pinch, the actual concentrations and total curie amount is not actually known.

"In study of uranium and the dependence of the size of the uranium pieces or powder, it has been observed that dispersed fine uranium powder would require higher ignition temperatures than larger pieces of uranium. **This indicates that finer particles of uranium would be less likely to spark when in the open trough for examination. But, conversely, the fine uranium powder would ignite at lower temperatures when packaged in a barrel.** [169] [emphasis added]

"Apparently, there was no monitoring of the hydrogen gas buildup after repackaging the waste. So, while the hydrogen gas buildup was occurring within hours, rather than weeks or months of storage, Fluor had assumed that the waste would behave as previously repackaged barrels of waste had. And Fluor assumed this despite not actually knowing what chemicals or combinations of chemicals were present in the drum.

"The local Department of Energy, Idaho and Idaho Cleanup Project contractor Fluor are planning to conduct an investigation to determine the cause of the accident. But, the decision to not have an investigation led by DOE Headquarters or other independent entity is, I believe, a mistake.

"There may be the temptation to avoid responsibility for any mistakes made that might reduce Fluor's award fee. There would also be the temptation for the local DOE-ID who approved current work processes as safe to seek a return to production in the most rapid and least cost approach which may leave safety issues unresolved. The managers at the Waste Isolation Pilot Plant (WIPP) in New Mexico should require the Department of Energy Headquarters to lead the accident investigation before this waste packaging is resumed, transported, and accepted by WIPP. Idaho's Department of Environmental Quality rubber stamped its approval of vastly increased RCRA mixed waste (chemical and radioactive transuranic waste) at the Idaho National Laboratory's Materials and Fuels Complex last year DOE's vague statements about fire protection for the transuranic waste. [170] [171] [emphasis added]

Media reports on INL Cleanup contractor on *Fluor Idaho Continues Analysis of Drum Breach at INL* and the need for an independent analysis by the General Accounting Office.

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[168] B. L. Anderson et al., Hydrogen Generation in TRU Waste Transportation Packages, NUREG/CR-6673, UCRL- ID-13852, Lawrence Livermore National Laboratory, February 2000, https://www.nrc.gov/docs/ML0037/ML003723404.pdf p. 77 "Aromatic hydrocarbons, such as benzene, toluene, and cyclohexene protect TBP from radiolysis, while saturated hydrocarbons such as hexane, cyclohexane, and dodecane sensitize TBP to radiolytic degradation (Barney and Bouse 1977). Carbon tetrachloride has also been found to sensitize TBP radiolysis."

[169] M. Epstein et al., Fluor Hanford, "Uranium Pyrophoricity Phenomena and Prediction," SNF-6192-FP, April 2000. https://www.osti.gov/servlets/purl/803044

[170] Thatcher, Tami, Environmental Defense Institute Special Report, "Public Comment for Class 2 RCRA Permit Modification for Materials and Fuels Complex," 2017. www.environmental-defenseinstitute.org/publications/EDIRCRAcomments2017.pdf

[171] Thatcher, Tami, Several Barrels of Waste Over pressurize Within Hours After Being Repackaged at the Idaho Cleanup Project ARP V, May 2018 EDI Newsletter. http://environmental-defense-institute.org/publications/News.18.May.pdf

"Fluor Idaho expects in September to finish decontamination operations at the Idaho National Laboratory site where four 55-gallon drums of radioactive waste overheated and ruptured on April 11.

"The company also said, in a June 28 report on the incident to the Idaho Department of Environmental Quality, it should issue its final investigation findings in November, but no date has been set for resumption of waste repacking within Airlock 5 of the Accelerated Retrieval Project 5 facility.

"The causal analysis of the event is being finalized, the Idaho Cleanup Project contractor reported. Fluor Idaho has said previously "a significant portion" of the potential 220 gallons of repackaged waste sludge spewed onto the floor after the drums overheated and blew their lids. More than 90 percent of the spilled material has been gathered up using a vacuum and brush and placed in new containers.

"In addition to analyzing samples of the sludge, Fluor Idaho is also studying a drum within the retrieval area that did not overheat. Both analyses are part of the company's efforts to determine what caused the overpressurization event.

"Since the incident, crews have entered the airlock area about 50 times for decontamination work and take samples, according to the report. There continues to be no sign of contamination outside the building, Fluor Idaho said.

"The company's most recent report covers the period from May 25 through June 21.

"The drums contained waste sludge shipped to INL decades ago from the former Rocky Flats nuclear weapons site in Colorado. The drums had not gone through the final characterization and certification process prior to shipment to DOE's Waste Isolation Pilot Plant in New Mexico.

"As a result of the accident, the Senate's fiscal 2019 National Defense Authorization Act calls upon the Government Accountability Office (GAO) to report on repackaging of transuranic waste at the Idaho National Laboratory." [172]

Section IX. What is Required for Appropriate Remediation of SDA?

Technically, once any material that is EPA RCRA listed mixed hazardous/radioactive waste is accessed/ handled during a remediation action, it reenters the regulatory phase and cannot be returned to its original dump unless the dump qualifies as a licensed Subtitle C mixed hazardous/radioactive waste landfill. This is another fundamental flaw in DOE's "Targeted Waste Retrieval" program that must be recognized and corrected. By only extracting, what are called "hot spots" in a pit/trench that probes into the waste have identified and only limiting the retrieval to these spots and leaving the rest of the mixed hazardous radioactive waste in place is illegal under the following Land Disposal Restrictions.

EPA Requirements for Management of Hazardous Contaminated Media states:

> "To accomplish the objective, the proposal would establish modified Land Disposal Restrictions (LDR) treatment requirements, and modified permitting procedures for higher-risk, contaminated media that remain subject to hazardous waste regulations; and give EPA and authorized States the authority to remove certain lower-risk, contaminated media from regulation as ''hazardous wastes'' under most of Subtitle C of RCRA. [173]

40 CFR 265.114 Disposal or decontamination of equipment, structures and soils states:

> "During the partial and final closure periods, all contaminated equipment, structures and soil must be properly disposed of, or decontaminated unless specified otherwise in §§ 265.197, 265.228, 265.258, 265.280, or 265.310. By removing all hazardous wastes or hazardous constituents during partial and final closure, the owner or operator may become a generator of hazardous waste and must handle that hazardous waste in accordance with all applicable requirements of part 262 of this chapter."

40 CFR 268.50 Prohibitions on storage of restricted wastes states:

> "(a) Except as provided in this section, the storage of hazardous wastes restricted from land disposal under subpart C of this part of RCRA section 3004 is prohibited, unless the following conditions are met: (1) A generator stores such wastes in tanks, containers, or containment buildings on-site solely for the purpose of the accumulation of such quantities of

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[172] Fluor Idaho Continues Analysis of Drum Breach at INL, Exchange Monitor, July 05, 2018 https://www.exchangemonitor.com/fluor-idaho-continues-analysis-drum-breach-inl/?printmode=1

[173] 40 CFR Parts 260, 261, 262, 264, 268, 269 and 271 [FRL–5460–4] RIN 2050–AE22 Requirements for Management of Hazardous Contaminated Media (HWIR-Media) Federal Register / Vol. 61, No. 83 / Monday, April 29, 1996 / Proposed Rules.

hazardous waste as necessary to facilitate proper recovery, treatment, or disposal and the generator complies with the requirements in §§ 262.16 and 262.17 and parts 264 and 265 of this chapter."
"(b) An owner/operator of a treatment, storage or disposal facility may store such wastes for up to one year unless the Agency can demonstrate that such storage was not solely for the purpose of accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal.
"(c) An owner/operator of a treatment, storage or disposal facility may store such wastes beyond one year; however, the owner/operator bears the burden of proving that such storage was solely for the purpose of accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal."
"(e) The prohibition in paragraph (a) of this section does not apply to hazardous wastes that meet the treatment standards specified under §§ 268.41, 268.42, and 268.43 or the treatment standards specified under the variance in § 268.44, or, where treatment standards have not been specified, is in compliance with the applicable prohibitions specified in § 268.32 or RCRA section 3004."

The point of the above EPA regulations is to show that DOE is illegally leaving RCRA listed reactive/ hazardous/radioactive waste in the SDA. As noted above and must be repeated, the RWMC/SDA could not even qualify as a municipal garbage dump under EPA's Subtitle D criteria for a municipal landfill much less a Subtitle C mixed hazardous/radioactive waste dump.

Also we cannot state often enough that the SDA's waste is the most biologically hazardous material on the planet that monitoring reports document (as stated above) is migration into the aquifer. Specific past actions by Idaho Governor Andrus to create the 1995 Idaho Settlement Agreement is important explain because they were responding to public anger of Idaho being used as a nuclear waste dump. There was an extensive IDEQ public comment process and a state public vote that fully supported Governors' Andrus and Batt the 1995 Idaho Settlement Agreement. The Governors' understood what was at stake and the hazard Idahoans faced by DOE violations of the legal requirements for proper disposal of these extremely deadly waste.

Nuclear Regulatory Commission Regulations on Low-level Mixed Radioactive Waste (LLMRW) also apply to INL's RWMC/SDA dump.

40 CFR § 266.255 When is your LLMW no longer eligible for the storage and treatment conditional exemption? [66 FR 27262, May 16, 2001, as amended at 81 FR 85827, Nov. 28, 2016]
(a) When your LLMW has met the requirements of your NRC or NRC Agreement State license for decay-in-storage and can be disposed of as non-radioactive waste, then the conditional exemption for storage no longer applies. On that date your waste is subject to hazardous waste regulation under the relevant sections of 40 CFR parts 260 through 271, and the time period for accumulation of a hazardous waste as specified in 40 CFR 262.16 or 262.17 begins.
(b) When your conditionally exempt LLMW, which has been generated and stored under a single NRC or NRC Agreement State license number, is removed from storage, it is no longer eligible for the storage and treatment exemption. However, your waste may be eligible for the transportation and disposal conditional exemption at § 266.305.

§ 266.305 What does the transportation and disposal conditional exemption do?
This conditional exemption exempts your waste from the regulatory definition of hazardous waste in 40 CFR 261.3 if your waste meets the eligibility criteria under § 266.310, and you meet the conditions in § 266.315.

§ 266.315 What are the conditions you must meet for your waste to qualify for and maintain the transportation and disposal conditional exemption?
You must meet the following conditions for your eligible waste to qualify for and maintain the exemption:
(a) The eligible waste must meet or be treated to meet LDR treatment standards as described in § 266.320.
(b) If you are not already subject to NRC, or NRC Agreement State equivalent manifest and transportation regulations for the shipment of your waste, you must manifest and transport your waste according to NRC regulations as described in § 266.325.
(c) The exempted waste must be in containers when it is disposed of in the LLRWDF as described in § 266.340.
(d) The exempted waste must be disposed of at a designated LLRWDF as described in § 266.335.

§ 266.335 Where must your exempted waste be disposed of?
Your exempted waste must be disposed of in a LLRWDF [Low-level Mixed Radioactive Waste] that is regulated and licensed by NRC under 10 CFR part 61 or by an NRC Agreement State under equivalent State regulations, including State NARM licensing regulations for eligible NARM.

Congress' RCRA landmark hazardous waste legislation allowed EPA to issue Land Disposal Restrictions (LDR) program that sets standards on hazardous waste dumps with the following purpose:

> "The purpose of this document is to provide you with a usable summary of the requirements of the Land Disposal Restrictions (LDR) program. The LDR program under 40 *CFR* Part 268 has grown and changed since its introduction in 1986. The Environmental Protection Agency (EPA) made significant efforts over the years to address public and industry suggestions for improvement by streamlining the program and providing compliance assistance." [174]
>
> "The RCRA regulations constitute minimum national standards for management of hazardous wastes. In general, they apply equally to all hazardous wastes, regardless of where or how generated, and to all hazardous waste management facilities, regardless of how much government oversight any given facility receives. In order to ensure an adequate level of protection nationally, the RCRA regulations have been conservatively designed to ensure proper management of hazardous wastes over a range of waste types, environmental conditions, management scenarios, and operational contingencies.
>
> "For example, the stringent treatment requirements established by RCRA land disposal restrictions (LDRs) have encouraged many generators to reduce the amount of hazardous waste they generate. On the other hand, when these requirements are applied in the context of site cleanup, they often provide a strong incentive to leave hazardous waste and contaminated media in place, or to select alternate remedies that will minimize the applicability of RCRA regulations. This can result in remedies that are less protective of human health and the environment. (See 54 FR 41566, October10, 1989; 58 FR 8658, (February 16, 1993); and the information in the docket to today's proposed rule)).
>
> "In the administration of remedial programs such as Superfund and these corrective action program, EPA and the States are already faced with an unacceptable situation that must be remedied while operating within the technical and practical realities of the site.
>
> "For example, contaminated media are often physically quite different from as generated wastes. Contaminated soils often contain complex mixtures of multiple contaminants, and are highly variable in their composition, handling, and treatability characteristics. For this reason, treatment of contaminated soils can be particularly complex, involving one or a series of custom-designed treatment systems. As-generated wastes however, are usually more consistent in composition, since they are derived from specific known manufacturing processes. [175] [emphasis added]

The importance of the above EPA and NRC regulatory information is to emphasize the existing Land Disposal Restrictions and how DOE with current state and EPA regulatory agencies are violating them by leaving most of the hazardous waste in the SDA. Also it's important to show the extent of RCRA listed hazardous contaminants that are co-mingled in all the waste and soil media. The small quantity (<10%) of targeted waste that DOE is simply leaving the remaining RCRA waste in place and thus violates the statutory cleanup requirements defined as:

> "**Statutory Preference for Treatment**—The National Oil and Hazardous Substances Pollution Contingency Plan expresses a preference for remedies that use permanent solutions and alternative treatment technologies to the maximum extent possible to reduce toxicity, mobility, and volume. The Selected Remedy employs treatment, which is statutorily preferred to the extent practical, as a principal element of the remedy, as follows: (1) in situ grouting to reduce mobility of technetium-99 and iodine-129, (2) flameless catalytic oxidation and destruction of solvent vapors collected from the vadose zone, and (3) treatment of targeted waste, if needed, to satisfy disposal requirements."
>
> "SDA contains high organic content waste that contains solvents (e.g., carbon tetrachloride, tetrachloroethylene, and trihreat waste. Carbon tetrachloride has been detected at levels slightly above its maximum contaminant level (MCL) in the aquifer. Principal threat waste is largely contained within targeted waste and will be addressed through removal of targeted thin 5.69 acres and through treatment of vapors by the vapor vacuum extraction system. [Pg. iii]
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> "Monitoring and modeling indicate that carbon-14 and technetium-99 could threaten groundwater thresholds)

[174] Land Disposal Restrictions: *Summary of Requirements* Revised August 2001, Offices of Solid Waste and Emergency Response & Enforcement and Compliance Assurance, Pg. 1-1, ECDIC-2002-013; PA530-R-01-007. www.epa.gov/osw
[175] Ibid, ECDIC-2002-013; PA530-R-01-007.

beneath the SDA over the next 100 years. Carbon tetrachloride from solvents already exceeds its MCL, and several other contaminants of concern could exceed MCLs over the next few hundred years. Other secondary contaminants of concern (e.g., uranium-238) could exceed MCLs several thousands of years in the future. To inhibit migration of contaminants from buried waste a surface barrier will be constructed to reduce infiltrating moisture that would move through the SDA and downward toward the Snake River." [176]

"The storage of any form of hazardous waste is prohibited unless the waste has available treatment to meet land disposal restriction (LDR) requirements in accordance with 40 CFR 268 of the Resource Conservation and Recovery Act (RCRA). In 1992, Congress passed the Federal Facility Compliance Act (FFCA), which allows for the storage of radioactive and hazardous mixed waste (mixed waste) until available treatment can be developed that meets the LDR requirements. Transuranic-contaminated mixed (TRU) waste is covered under the [Federal Facility Compliance Act] FFCA through the Site Treatment Plan (STP) since the implementation of the plan in November, 1995." [emphasis added]

"The State of Idaho, Department of Environmental Quality (State or DEQ) asked DOE to submit enforceable schedules under the STP for transportation of mixed TRU from INEEL to WIPP. Because such waste is no longer considered to be prohibited waste under RCRA, the Department of Energy's position is that they should no longer be subject to the enforceable requirements under the STP. The Department of Energy Idaho Operations Office (DOE-ID) proposed to the State that all TRU waste that was designated for disposal at WIPP be removed from the STP or that any schedules for shipments to WIPP be provided under the processes of the STP for information only.

"The State concurred that wastes properly designated for disposal at WIPP were not subject to the LDR requirements but did not concur that all mixed TRU waste currently located at the INEEL had been properly "designated" within the meaning of the Amendment Act. The State also disagreed that these wastes are exempt from the enforceable section of the STP and requested DOE-ID to comply with the appropriate sections of the STP." [177]

"The Federal Facilities Compliance Act (FFCA) required all DOE facilities managing mixed waste to develop Site Treatment Plans (STP) to address mixed waste that are subject to Land Disposal Restrictions (LDR) standards promulgated pursuant to RCRA Section 3004 (m). In 1996 the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Amendment Act states that 'transuranic mixed waste designated by the Secretary [of Energy] for disposal at WIPP…. is exempt from treatment standards promulgated pursuant to section 3004 (m) of [RCRA]'. Therefore, DOE position is that Transuranic mixed waste destined for WIPP is not subject to, or requires inclusion in, the provisions of the STP." [178]

"While DEQ concurred that waste properly designated for disposal at WIPP are not subject to the LDR restrictions of RCRA, DEQ did not concur that all mixed TRU waste currently located at the INEEL was properly designated within the meaning of the WIPP Withdrawal Act. DEQ also did no agree that such wastes are exempt from the STP of the enforceable schedules found in the STP. Instead DEQ believed that the STP must be complied with until such time as the wastes have been shipped to WIPP.

"DEQ interpret the amendments to the WIPP Withdrawal Act to require that a waste acceptance determination be made prior to being removed from the STP. Wastes destined for disposal at WIPP must be designated as such by the STP and information related to interim storage and transport to WIPP is provided. For wastes that have not yet been identified in the STP as going to WIPP, these wastes must stay in the relevant portion of the STP, even if they may eventually be so designated. Finally, DEQ requested that before removal from the enforceable STP schedules, all wastes listed in the STP as TRU waste must be shown to meet the Waste Acceptance Criteria (WAC) at WIPP. This would satisfy DEQ that these wastes would indeed be accepted at WIPP.

"Several written correspondences were submitted back and forth between DEQ and DOE. Based on the position of DEQ, DOE responded with a position paper detailing portions of the WIPP withdrawal Act where DEQ and DOE agreed and disagreed. At this time there are two positions, out of three, on the table being discussed. These positions are: 1) That all TRU waste stored at the INEEL be removed from the INEEL STP since the waste is "designated" for disposal at WIPP, 2) That all TRU waste streams remain in the INEEL STP, but in a new section of the STP which has no enforceable milestones, and 3) That only the TRU waste streams that meet the WIPP WAC will exit the INEEL STP. Positions 1 & 2 above are both acceptable to DOE, but position 3 is not because of the potential for enforceable

[176] DOE/ID-11359, Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14, Revision 0 September 2008, DOE/ID-11359.

[177] TRU MANAGEMENT IN THE SITE TREATMENT PLAN AT THE INEEL, WM'02 Conference, February 24-28, 2002, Tucson, AZ, Monte Davis, Bechtel BWXT Idaho, LLC, Report Abstract.

[178] TRU MANAGEMENT IN THE SITE TREATMENT PLAN AT THE INEEL, Introduction.

milestones being applied to TRU waste before it is evaluated against the WIPP WAC or treated to meet the WIPP WAC.

"Since the negotiations has [sic] stalled in the technical level, the Idaho Attorney General's Office and the DOE- ID Office of Chief Counsel got involved in the specific of the laws. Both offices have outlined their positions and provided legal background to support these positions. Again, no movement has occurred and discussions have stopped short of filing legal suits in court and been returned to the technical groups for the next round of discussion, which are schedule for the end of January, 2002." [179]

"A change in the law did not sufficiently explain all potential regulatory interpretations to adequately address all issues that have arisen. DEQ and DOE find themselves in such a legal ambiguity with a uncertain resolution with in any linear timeframe. The potential for this issue to be taken to court is doubtful. Unless a solution is reached in January, 2002 it is very likely that public involvement may occur." [180] [emphasis added]

Section X. DOE's Misguided Policy to Leave SDA Storage Pad A in Place

In a special EDI report titled *INL Contamination and the Snake River Plain Aquifer – The Essentials* Tami Thatcher document the extensive aquifer contamination from RWMC waste.

> "Transuranic waste from the Rocky Flats Plant included extensive amounts of chemical solvents were buried at RWMC until 1970. An estimated 88,400 gal of organic waste included 24,400 gal of carbon tetrachloride; 39,000 gal of lubricating oil; and about 25,000 gal of other organic compounds, including trichloroethane, trichloroethylene, perchloroethylene, toluene, and benzene. About 17,100 Ci of plutonium238, 64,900 Ci of plutonium-239, 17,100 Ci of plutonium-240, and 183,000 Ci of americium-241 were buried during 1952 to 1999. After Rocky Flats waste was supposedly no longer "buried" for "temporary" storage at RWMC, some of the waste that was to be "retrievable" was placed on "Pad A." For this particular waste, the barrels were stacked on an asphalt pad, plywood was placed over the barrels, and a few feet of soil were placed over the uranium and nitrate-laden oxidizing waste.
>
> **"Stored waste Pad A**
>
> "Nitrate and Uranium concentrations keep increasing and the proposed solution is to leave Pad A there and stop monitoring near Pad A. I'm not kidding! (See the DOE/NE-ID-11201 Rev. 3 Five Year Review.) Don't worry – institutional control will be maintained until the 5 year reviews for the CERCLA site end. They simply say that institutional controls will be in effect for "at least 100 years" — knowing that the wastes will trickle out health significant levels of contaminants for hundreds of thousands of years. Most of what was buried at RWMC will remain buried there—that is except Pad A, which was never actually buried and will supposedly be protected by a contoured cap — a feature that the proposed INL Replacement Facility says cannot be maintained and is actually detrimental. While retrieving buried waste for CERCLA cleanup at great effort and expense, DOE has continued to add radioactive waste to RWMC. As the CERCLA cleanup of long-lived transuranic waste from Rocky Flats was being retrieved to be sent to WIPP as agreed to by DOE, Idaho Department of Environmental Quality, and the Environmental Protection Agency, other long-lived contaminants like technetium-99 and iodine-129 have quietly been added in the form of resins and other remote-handled wastes from Naval and DOE reactor operations. So, while volatile chemicals continue to be vacuum extracted, the dominant radionuclide contributors to aquifer contaminants will be technetium-99 and iodine-129 from INL wastes regardless of meeting the Idaho Settlement Agreement to ship about 6 acres of the 35 acres of buried transuranic waste from RWMC." [181]

DOE's Plan not remove Pad A and only maintain soil cover in the SDA states: "The composition of the Pad A wastes was identified based on information from Rocky Flats Plant, the major source totaling 10,200 cm that consist of: 7,250 cm of evaporator salts, primarily sodium and potassium nitrates contaminated with plutonium, americium, thorium; And potassium-40; Approximately 2,250 cm of waste containing oxides of

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[179] TRU MANAGEMENT IN THE SITE TREATMENT PLAN AT THE INEEL, Pg. 3.

[180] TRU MANAGEMENT IN THE SITE TREATMENT PLAN AT THE INEEL, Pg. Conclusion.

[181] Tami Thatcher, EDI special report, *INL Contamination and the Snake River Plain Aquifer – The Essentials*, http://environmental-defense-institute.org/publications/aquiferRev4.pdf

uranium, uranium casting waste, beryllium foundry wastes, and machining wastes from Rocky Flats; Dry sewage sludge from Rocky Flats containing low levels of transuranic radionuclides." [182]

Leaving Pad A in place also violates the commitment given to the public in the WMPEIS that states: "DOE plans to dispose of TRUW generated from defense activities and retrievably stored since 1970 at a geologic repository called the Waste Isolation Pilot Plant (WIPP), located near Carlsbad, New Mexico. [183]
[Pg.7-79] DOE-EIS-0200-F,

According to a joint DOE/EPA/IDEQ Declaration for Pad A Assessment of the Site:

> "Threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment. Implementation of the remedial action selected in this ROD will provide re-contouring, maintenance, monitoring of the cover, and institutional controls at Pad A to ensure effectiveness of the existing cover and to minimize potential future exposure and migration of contaminants from the pad. If contaminants from Pad A were to migrate from the pad, they may potentially contaminate the subsurface area or groundwater. [Pg.1]
>
> "This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site; <u>however, because the wastes can be reliably controlled in place, treatment of the principal sources of contamination was not found to be necessary. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Because this remedy will result in hazardous substances remaining onsite above healthbased levels, a review will be conducted within two years after commencement of remedial action, and every five years thereafter, to ensure .that the remedy continues .to provide adequate protection of human health and the environment. [Pg. ii]</u> [emphasis added]
>
> "Approximately 10,200 rn3 (13,341 yds.) of containerized solid wastes were placed on a 73.2 x 102.1 m (240 x 335 ft) asphalt pad, known as Pad A, at the SDA from September 1972 to August 1978. <u>The asphalt pad is approximately 5.6 to 6.1 cm (2 to 3 in.) thick. The depth from the bottom of the asphalt pad to the underlying basalt ranges from 0.3 to 3.7 m (1 to 12 ft). Pad A presently has a soil cover that averages about 1.2 m (4 ft) thick. [Pg.2]</u>
>
> "LLW contaminated with TRU isotopes 510 nCi/g is disposed of in the SDA. <u>All but two shipments of waste disposed of on Pad A are classified as LLW (i.e., <100 nCi/g); the other two shipments contained waste with TRU radionuclide concentrations >100 nCi/g. One shipment consisted of eight drums with a total loading of 583.2 nCi/g, and the second shipment consisted of two drums with a total loading of 108.6 nCi/g. No waste disposal has occurred on Pad A at the SDA since its closure in 1978." [Pg.4] [184]</u> [emphasis added]
>
> "Management Information System (RWMIS). The RWMIS was initiated in 1971 and is considered to be the official INEL record for solid radioactive wastes. Pad A wastes are primarily composed of nitrate salts, depleted uranium waste, and sewer sludge. Wastes, totaling approximately 10,200 m3 (13,341 yd3), at Pad A consist of:
>
> - Approximately 7,250 m3 (9,483 yd3) of evaporator salts from the RFP contaminated with transuranic radionuclides
> - Approximately 2,250 m3(2,943 yd3) of waste consisting primarily of oxides of uranium, uranium casting wastes, beryllium foundry wastes, and machining wastes from RFP (hereinafter referred to as depleted uranium and beryllium foundry wastes) Dry sewage sludge from the RFP contaminated with low levels of TRU radionuclides.
>
> "Miscellaneous INEL-generated radioactive wastes such as lab waste, counting sources, and uranium standards. The evaporator salts are primarily sodium nitrate and potassium nitrate (60% sodium nitrate, 30% potassium nitrate, 10% miscellaneous). <u>The nitrates at Pad A have been reviewed against 40 Code of Federal Regulations (CFR) 261.21(a)(4) and 49 CFR 173.151 and appear to exhibit the properties of an oxidizer. It is recognized that this type of oxidizer can have the characteristic of ignitability. Radioactive contamination includes plutonium, americium, thorium, uranium, and</u>

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[182] Proposed Plan for Pad A at the Radioactive Waste management Complex INL, July 1993, Department of Energy, Environmental Protection Agency Region 10 and Idaho Department of Environmental Quality, Pg.5 and 12.

[183] DOE-EIS-0200-F, Final Waste Management Programmatic Environmental Impact Statement For Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste, Summary, May 1997, Pg.7-79.

[184] DECLARATION FOR PAD A AT THE RADIOACTIVE WASTE MANAGEMENT COMPLEX SUBSURFACE DISPOSAL AREA AT THE IDAHO NATIONAL ENGINEERING LABORATORY, Idaho Falls, Idaho January 1994, signed by DOE, EPA and JERRY L. HARRIS Director Idaho Department of Health and Welfare

potassium-40. [emphasis added]

"Miscellaneous wastes at Pad A include other inorganic salts, dirt, concrete, and other materials. Approximately 4,600,000 kg (10,143,000 lbs.) of inorganic salts from Rocky Flats are contained in 1,275 plywood boxes and 15,400 drums according to information from the RWMIS. The total inorganic salt waste consists of approximately 60% sodium nitrate (NaNO3), 30% potassium nitrate (KNO3), and 10% chloride, sulfate, and hydroxide salts.

"Based on RWMIS information, the volume of salts in the containers noted above comprises 71% of the total waste volume in Pad A." [Pg.10] [185]

"7.1 Remedial Action Objectives: The risk assessment indicates that there is no current risk to workers or the public from Pad A. However, fate and transport modeling indicated a potential future risk in approximately 250 years due to exceedances of drinking water standards for nitrate if residents used the groundwater directly adjacent to the Pad A boundary. This fate and transport modeling used conservative assumptions in order not to underestimate risks. [Pg. 44]

"The nitrates at Pad A have been reviewed against 40 CFR 261.21(a) (4) and 49 CFR 173.151 and appear to exhibit the properties of an oxidizer. It is recognized that this type of oxidizer can have the characteristic of ignitability. The RCRA closure requirements are applicable when (a) the waste is hazardous and (b) the unit received the waste after RCRA requirements became effective. Pad A does contain RCRA hazardous waste but the waste was placed from 1972 through 1978, before RCRA requirements became effective; therefore, RCRA closure requirements are not applicable to the wastes in Pad A. However, certain RCRA closure requirements in 40 CFR. Subpart N, specifically §264.310, are considered to be relevant and appropriate. Because the residual contamination in the pad may pose a direct contact threat, but is not expected to pose a groundwater threat, relevant and appropriate requirements include: (a) a cover, which may be permeable, to address the direct contact threat; (b) limited long-term management including site and cover maintenance and groundwater monitoring; and (c) institutional controls (e.g., land-use restrictions or deed notices) to restrict access.[pg.45] [186] [emphasis added]

"In May 1992, 38 soil samples were taken from various locations on the Pad A soil cover. Radionuclides detected in several of the samples included Am-241, detected in nine samples with concentrations ranging from 0.78 to 6.66 pCi/g, Cs-137 detected in five samples with concentrations ranging from 0.06 to 0.1 pCilg, and Co-60 detected in only one sample at a concentration of 0.14 pCi/g. The measured concentrations are consistent with concentrations detected in past environmental monitoring/sampling activities conducted at Pad A and other areas of the RWMC and were determined to warrant no further consideration.

"The Pad A overburden soil inorganic results were screened against INEL background surface soil concentrations established in 1989. Only three inorganic contaminants, beryllium, mercury and manganese, were present in some of the samples above the INEL background levels. Beryllium was detected in one sample at a concentration of 84.6 mg/kg above the background concentration of 2 mg/kg. Mercury was detected in two samples at 59 concentration of 0.11 mg/kg and 0.75 mg/kg above the background concentration of 0.06 mg/kg. Manganese was detected in five samples at concentrations from 629 to 869 mg/kg. The background concentration for manganese is 636 mg/kg. All other metals were not present above INTEL background levels at the 95% confidence limit. Based on the limited number of sample results above the INEL background levels, the measured concentrations were determined to warrant no further consideration. [emphasis added]

"VOCs were detected positively in only two of the 38 samples. These two sample results indicate a potential single isolated VOC source within Pad A. The amount of VOCs posed by these isolated sample results is considered to be very small and, as such, would have no impact on the previous decisions. Additionally, the planned institutional controls to be implemented by this ROD will adequately prevent any exposure to the VOCs.

"In addition to these soil samples, one set of soil moisture samples was obtained in June 1986 from two wells located at the south end of Pad A at a depth of 4.37 m (14 ft 4 in.) and 2.64 m (8 ft 8 in.). The soil moisture samples were analyzed for nitrates and showed concentrations of 13 and 48 mg/kg. As with the overburden sampling, the concentrations suggested by the samples are adequately bounded by the Pad A BRA and deemed to have no impact on previously reported results. " [187] [pg.60] [emphasis added]

[185] Ibid., DECLARATION FOR PAD A by DOE/EPA/IDEQ, Pg.10
[186] Ibid. DECLARATION FOR PAD A by DOE/EPA/IDEQ, Pg. 45.
[187] Ibid., DECLARATION FOR PAD A by DOE/EPA/IDEQ, Pg. 60

Section XI. DOE has No Plans to Remove Soil Vault Highly Radioactive Waste in the SDA

Despite the above previous Idaho Governor Andrus and Batt leadership objections INL waste removal, the current Governor Otter and the Department of Energy, Idaho Department of Environmental Quality and the Environmental Protection Agency ("Agencies") issued their joint buried waste Plan for the INL Radioactive Waste Management Complex (RWMC); Operable Unit 7-13/14; October, 2007 ("Plan") as a requirement by CERCLA. This slick publication offers no detailed information about waste characterization or current contaminate plumes (except for some volatile organic compounds for vapor extraction) so the public is left without crucial data on which to make informed decisions. [188]

The Agencies "Preferred Alternative" [pg. 25] will leave huge quantities of hazardous and long-lived radioactive waste in place to further contaminate Idaho's sole source aquifer. Even IDEQ has reservations. "[T]he State has not agreed to accept DOE's currently proposed retrieval area of 5.69 acres." [pg. 40] Leaving the remaining 30.2 acres of SDA buried waste permanently in place in a flood zone to continue leaching hazardous and radioactive contaminates into the underlying aquifer is unconscionable. The RWMC flooded the RWMC numerous times in the past. Water samples under the SDA show:

> "Radionuclides that exceed 25% of drinking water standards are neprtunium-237, plutonium-239, plutonium-240, technetium-99, uranium-234, and unarium-238. These radionuclides all have half-lives, with the minimum half-life being 6,537 years for plutonium-240." [189] [Pg.7-79] [DOE-EIS-0200-F,]

In 1977, the use of soil vaults (the use of the word "vault" is a misnomer because they're just holes in the ground with 2 metal waste cans are dropped) for the disposal of high-radiation-level waste since dumping began in the SDA. Soil vaults eventually replaced trenches for the disposal of such waste. The vaults are drilled in rows, as shown in Figure 1-2. As of this writing, final preparations are underway to dispose of future high radiation level LLW in concrete lined vaults placed in SDA pits 17-20. [190]

The 21 rows of post-1977 soil vaults (~1,200 holes each with at least 2 waste cans each) largely contain INL Naval Reactor Facility spent nuclear fuel parts that individual shipments typically contain over 10,000 curies of remote handled waste. It is no wonder that DOE is averse to exhuming this deadly/extremely radioactive waste. [191] [192] However, these soil vault containers can be exhumed and put into the existing NRC permitted above ground shielded interim storage at INL/INTEC or the newly constructed Remote-Handled Disposal Facility near INL/ATRC. Additionally, as documented below, DOE fails to acknowledge that about 90.28 metric tons of spent nuclear fuel was dumped in the SDA. [193]

> "Soil Vault Row [SVR] disposal practices also were modified to minimize personnel exposures to radiation emanating from waste. Beginning in 1977, areas not suited for pits were reserved for SVRs, typically used for disposing of remote-

[188] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007.

[189] Ibid., DOE-EIS-0200-F, Pg.7-79.

[190] Ibid. INEL-95/0310, Pg. 1-7.

[191] Ibid. DOE/ID-11513, pg. 10-31

[192] The INL Site EM CAB will meet Thursday, June 22, 2017 in Idaho Falls agenda. "During active RWMC operations about 241,000 cubic meters of waste were disposed in 21 pits, 58 trenches and 21 soil vault rows (totaling approximately 35 acres)."

[193] Radioactive Waste Management Information System; Solid Master Database, P61SH090, printouts, 1954 to1989, Books 1 through 5, a.k.a. RWMIS. These printouts show each shipment to RWMC along with origin, content and estimated curie amount. EDI gained access to all 5 volumes via FOIA and found after reviewing it were able to manually total some of waste i.e., amount of SNF.

handled waste. Drilled in rows, soil vaults consisted of unlined, cylindrical, vertical holes with diameters ranging from 0.4 to 2 m (1.3 to 6.5 ft) and averaging about 3.6 m (12 ft) deep.

"Vaults in any given row are at least 0.6 m (2 ft.) apart. A layer of soil at least 0.6 m (2 ft) thick was placed in bottoms of holes when basalt was penetrated during drilling. Soil vaults were designed for disposing of high-radiation waste that was defined as material producing a beta-gamma exposure rate greater than 500 mR/hour at a distance of 0.9 m (3 ft). Soil vault disposals were conducted concurrently with trench disposals from 1977 to 1981. Trenches also received high-radiation waste until trench disposal was discontinued in 1981.[3-8]

"The final report (McKinley and McKinney 1978a) states that about 6.1% of the drums (1,236 drums) had external alpha contamination to 120,000 cpm and these drums all came from Pit 11. Drums from Pit 12 had no external contamination except for some fixed contamination. Approximately 2.4% of the drums (486 drums) were breached and about one third of these drums (162 drums) leaked free liquids. The leaking free liquid was usually uncontaminated though contamination levels up to 40,000 cpm were found in some of the liquids. No further analysis was reported in the document. [194] [3-17] [emphasis added]

"Treatment to reduce gas generation is considered in this PEIS. For TRU, gas could be generated by the corrosion of metal containers t themselves, and by microbial decomposition of the waste. DOE is evaluating in the WIPP SEIS-II (DOE, 1996e) an alternative for disposal of TRUW after treatment to reduce gas generation." [195] [8-3]

The Plan will leave over >1,200 "soil vaults" (DOE documents show >20 rows) [196] permanently in place with only grouting to "reduce mobility of Tc-99 and I-129 waste migration." [197] Grouting is a known failed containment method because radiation degrades the grout over time and grout cannot be injected underneath the waste. Indeed, DOE claims grouting only "**reduces transport of contaminates into the vadose zone and aquifer**." [pg. 26]

"**Contaminant Generation, Transport, and Fate Mechanisms**

"This section provides a high-level description of the mechanisms that are important in controlling the fate of contaminants that are constituents of waste disposed in the subsurface at the INEEL. These mechanisms include those involved in releasing contaminants from the original waste form and those affecting the transport and fate of contaminants after release from the original waste form. Figure 2-2 summarizes the types of mechanisms that typically govern the exchange of contaminants between the altered waste zone and the natural geochemical environment in the subsurface. It is appropriate to discuss mechanisms that are important after contaminant release from a waste because these mechanisms can, in some cases, act to form secondary contaminant sources that continue to release contaminants into water after the original waste has ceased to do so. Secondary contaminant sources may act as long-term sources of contaminated groundwater that may persist well beyond the lifetime of the original waste. This section provides a summary of the mechanisms that are believed to be important for different disposal methods and a description of each of the mechanisms identified. [emphasis added]

"Advection and Dispersion

"Advection and dispersion affect all wastes released into the subsurface at INEEL. Advection is the movement of contaminants dissolved in water caused by the bulk movement of that water. Dispersion is the spreading of contaminants in water, and is caused by differences in the length of the flow path traversed by different parcels of water (and the contaminants dissolved in that water) and differences in flow velocity in different flow paths. Dispersion

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[194] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002, Pg. 3-17.

[195] Ibid., DOE-EIS-0200-F, Pg.8-3.

[196] ERP-Wag7-05 Rev 2, Radioactive Waste Management Complex, Subsurface Disposal Area, EG&G Diagram, Description/ Material/ Specification, No. 416511, Revised 3/19/92. Large plot plan (32"x20") of all Pits, Trenches Soil Vaults location, Pads and Liquid Acid Pit with individual number and Transuranic Storage Area Cells and Pads. Note F states: "Unrecorded waste hot spots uncovered during excavation of what is now Pit 20 and SVR-11, SVR 12 and SVR-16." Additional reference sees EDF No. ERP-Wag7-05 Rev 2.

[197] DOE/ID-11513, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site— Fiscal Years 2010– 2014, December 2015, DOE/ID-11513 Revision 0, pg. 10-29.

> mixes a plume of contaminated groundwater or vadose zone water with surrounding uncontaminated water, and acts to reduce maximum contaminant concentrations." [198] [emphasis added]

DOE relies on the above "dispersion mixes with groundwater" that results in lower water testing to give a false impression of the contaminate problem. "Dilution is the solution to pollution." As mentioned above, another disposal option for waste in Soil Vaults is the new Remote-Handled Waste Disposal Facility beside the Advanced Test Reactor Complex. [199] This action of leaving most of this dangerous waste in place, with deteriorating cans literally put future generations that rely on the Snake River Aquifer at significant and indefinite risk for potentially thousands of years (the toxic radioactive half-life of much of this waste).

At issue with the above cited DOE report is where they acknowledge how easily RWMC/SDA buried mixed hazardous and radioactive waste contaminates migrate (fate and transport) into the soil and groundwater. Despite this understanding of contaminate "dispersion" the "Agencies" have agreed to an extremely limited retrieval program that should be exhuming **all** of the hazardous/radioactive waste and contaminated soil required in the Land Disposal Regulations. As we discussed earlier we cite where the SDA waste during the spring months is in near water saturation from flooding, precipitation and area runoff. This equally effects the soil vaults adding to container deterioration and long-term contaminate migration.

Soil Vault Rows (1–13) No further action. This operable unit is addressed under OU 7-13/14. 7-02 also Acid Pit No CERCLA further action.

> "12.2.6.1 OU 7-01—Soil Vaults. Based on screening-level assessment of Soil Vault Rows 1 through 13, the Agencies concluded that waste in soil vaults would be evaluated in the comprehensive remedial investigation/feasibility study to assess potential transport of contaminants to the surface in concentrations that could exceed threshold values. Because the OU 7-13/14 RI/BRA and Feasibility all waste within the SDA, including that buried in soil vaults, no further action is under OU 7-01." [Pg.54] [200] [emphasis added]

From the beginning of RWMC in the 1950s the extremely radioactive waste of this type (INTEC/NRF) reactor fuel (not containing uranium) parts cut off the top and bottom of the assembly were dumped in the pits and trenches until 1977 when the use of holes bored in the ground for "soil vaults" was implemented. Again it must be emphasized that the highly radioactive waste now in the soil vaults was previous to 1977 was distributed in all the pits/trenches and therefore must be removed.

> "Soil Vaults Disposal practices also were modified to minimize personnel exposures to radiation emanating from waste. Beginning in 1977, areas not suited for pits were reserved for SVRs, typically used for disposing of remote-handled waste. Drilled in rows, soil vaults consisted of unlined, cylindrical, vertical holes with diameters ranging from 0.4 to 2 m (1.3 to 6.5 ft) and averaging about 3.6 m (12 ft) deep.
>
> "Vaults in any given row are at least 0.6 m (2 ft) apart. A layer of soil at least 0.6 m (2 ft) thick was placed in bottoms of holes when basalt was penetrated during drilling. Soil vaults were designed for disposing of high-radiation waste that was defined as material producing a beta-gamma exposure rate greater than 500 mR/hour at a distance of 0.9 m (3 ft).

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[198] INEEL/EXT-03-01169, INEEL Subregional Conceptual Model Report Volume 3, Rev 3: Summary of Existing Knowledge of Natural and Anthropogenic Influences on the Release of Contaminants to the Subsurface Environment from Waste Source Terms at the INEEL September 2003, Section 1.1, 2.2.1

[199] EDI June 2017 Newsletter - Environmental Defense Institute *www.environmental-defense-institute.org/publications/News.17.June.pdf*
Johnson, T.M., et al., Geology, "Groundwater "*fast paths*" in the Snake River Plain aquifer: Radiogenic isotope ratios as natural groundwater tracers," v. 28; no. 10; p. 871-874, October 2000. 21 US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote-. Handled Low-Level...

[200] ICP-EXT-05-00784, Pg. 54 and 80

> Soil vault disposals were conducted concurrently with trench disposals from 1977 to 1981. Trenches also received high-radiation waste until trench disposal was discontinued in 1981. [Pg.3-8]
> "Waste disposed of in the SDA must meet the requirements of waste acceptance criteria (DOE-ID 2001). However, exceptions can be obtained from DOE by completing an analysis that shows that overall limits on LLW inventories will not be exceeded. Exceptions have been made roughly once every three years. These exceptions have been related to a given disposal exceeding concentration limits or for unanticipated waste containing short-lived radionuclides such as H-3 or Cs-137. Waste disposal operations in the SDA are currently anticipated to extend until 2020 (McCarthy et al. 2000). [Pg.3-9]
> "3.1.3.1.3 Soil Vault Rows—Disposal in soil vaults was discontinued in 1993. Soil vaults are unlined holes bored 5.2 to 7.6 m (17 to 25 ft) deep that received remote-handled, containerized waste transferred from a bottom-discharge shipping cask. [Pg. 3-10] [201] [emphasis added]

At issue with the above cited DOE report is where they acknowledge how easily RWMC/SDA buried mixed hazardous and radioactive waste contaminates migrate (fate and transport) into the soil and groundwater. Despite this understanding of contaminate "dispersion" the "Agencies" have agreed to an extremely limited retrieval program that should be exhuming **all** of the waste and contaminated soil. Below we cite where the SDA waste during the spring months is in near water saturation from flooding, precipitation and area runoff.

Soil Vault Rows (1–13) No further action. This operable unit is addressed under OU 7-13/14. 7-02 also Acid Pit No CERCLA further action.

> "12.2.6.1 OU 7-01—Soil Vaults. Based on screening-level assessment of Soil Vault Rows 1 through 13, the Agencies concluded that waste in soil vaults would be evaluated in the comprehensive remedial investigation/feasibility study to assess potential transport of contaminants to the surface in concentrations that could exceed threshold values. Because the OU 7-13/14 RI/BRA and Feasibility all waste within the SDA, including that buried in soil vaults, no further action is under OU 7-01." [Pg. 54] [202] [emphasis added]

From the beginning of RWMC in the 1950s the extremely radioactive waste of this type (INTEC/NRF reactor fuel (not containing uranium) parts cut off the top and bottom of the assembly were dumped in the pits and trenches until 1977 when use of holes were bored in the ground for "soil vaults." All of this waste is remote-handled dumped using special bottom dump canisters that limited the exposure risk to workers.

Waste Type. Radionuclides disposed of in the soil vaults include those shown in Table 4.7-1. Many of these radionuclides may have decayed since emplacement. The form of the waste also varied. Identified waste forms are listed in Table 4.7-2 below.

Table 4-7-1 Radionuclides Disposed in Soil Vaults OU 7-01[pg. 4.7-4] [203]

46Sc	60Co	95Zr	119Sn	144Ce	240Pu
51Cr	90Sr	106Rh	125Sb	144Pr	228^{Th}
54Mi	90Y	106Ru	134Cs	182Ta	235U
58Co	95NB	19Cd	137Cs	239Pu	236U
58Fe					

Note the number of TRU nuclides in above table.

[201] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002
[202] ICP-EXT-05-00784, Pg. 54 and 80
[203] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment May 14, 1993, Section 4.7.1.2

Table 4.7-2. Wastes Identified in OU 7-01. [Soil Vaults] [pg. 4.7-4]

radioactive sources	HEPA filters
air cell waste	digs hardware
argon cell waste	hot cell waste
blanket subassemblies	misc. hardware
C/L MK-1A pin segment "	misc. resin bottles
combustible waste (paper, rags)	misc. scrap module wedges
dry active waste from jr. caves	misc. water pit hardware
hot fuel examination facility waste	misc. water pit waste
decon cell waste	S5w module holders
metal boxes and various pieces	type 1 hardware
plastics	type 2 hardware
smears	type 3 hardware
solidified liquid waste	canal waste
subassembly hardware	cell waste cans
tantalum, EOS-CAL MK II	metallurgical mounts
TREAT loop waste	MTR plugs in concrete
water in safety-set	misc. non compactible waste
SPERT scrap rods in can	TRA plant waste" [204]

Note many of the listed wastes identified above should be listed as TRU waste. Due to public pressure DOE agreed recently to stop using holes (soil vaults) in the SDA soil for the highly radioactive waste mostly from Navy's INL Naval Reactors Facility Expanded Core Facility that cuts off the non-fuel parts of the used reactor fuel assembly.

> "Concrete Vaults-Concrete vaults, used for remote-handled LLW, are located in the southwest corner of Pit 20. The concrete vaults were designed to conserve space within the SDA. Constructed of precast reinforced concrete sections resting on an integral base plate, vaults are configured in honeycomb arrays. Each array is surrounded by soil for additional shielding and seismic stability. Void spaces between vaults in each array are filled with sand. Once full, each vault is covered with a 1.2-m (4-ft) thick reinforced concrete plug. Seams between adjacent plug caps are sealed with acrylic caulk at the surface of the array to inhibit moisture infiltration (McCarthy et al. 2000). Approximately 50 concrete vaults have been constructed in Pit 20 and about half of them are full. Current plans include constructing additional concrete vaults in FY 2003 (McCarthy et al. 2000)."
> [Section 3.1.3.1.2] [205]

Section XII. SDA Acid Pit Also NOT Remediated

The Acid Pit lies right in the center of the SDA and was the location that DOE designated to receive a huge volume of highly contaminated listed RCRA hazardous liquids that then proceeded to migrate into the underlying soils, vadose zone and aquifer. This represents another tragic deficiency of the CERCLA cleanup program to simply walk away from without remediation.

> "OU 7-02 consists of the SDA acid pit located near the center of the SDA, and designated by site code RWMC-04. The pit was in use from1954to1961. It extends down to the top of the first basalt layer. Geophysical surveys have indicated significant metal objects in the pit. Suspected contaminants include radioactive and nonradioactive hazardous materials. This OU is scheduled for Track 2 scoping investigations. Reports indicate that as acids were placed in the pit line was periodically added to neutralize the acids. A soil cover was added on a daily or weekly basis. The pit received both liquid organic and inorganic wastes, some containing radionuclides. Informational searches indicate that disposed wastes include carbon tetrachloride, organic solvents (trichloroethylene, trichloroethane, and tetrachloroethylene), radioactively contaminated acids, and cleaning solutions. The radioactive contaminants are believed to be low-level wastes, primarily

[204] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment May 14, 1993 Section 4.7-4.

[205] INEEL-EXT-02-01125, Section 3.1.3.1.2

uranium, with some 90Sr's 127Cs, Co, and TRU radionuclides. The acids include nitric, sulfuric, hydrofluoric, and aluminum acids. The quantities added varied considerably, with the largest additions in the range of 150,000 L (40,000 gal).

"4.7.2.2 Waste Type. The wastes consist of contaminated soils, containing both radioactive and nonradioactive hazardous components. Metals have been found that exceed the INEL upper tolerance limits (UTL). These metals include mercury, sodium, and beryllium with some calcium, chromium, aluminum, manganese, iron, nickel, and vanadium. Radionuclides in excess of UTLs include both alpha and gamma emitters. Specific identifications of the radionuclides are not currently available.

Organic contaminants are compared to the sample "quantitation" limits (SQL). Volatile organics found exceeding these limits include methylene chloride, carbon tetrachloride, chloroform, acetone, and trichloroethane. Semivolatile organic materials exceeding the SQLs include bis (2-ethylhexyl) phthalate and tributylphosphate, Aroclor-1 254 was the only PCB found in concentrations greater than the SQLs." [206] [emphasis added]

The presences of these chemicals in the SDA Acid Pit are organic complexing agents that assist mobility of contaminates into the aquifer.

A final factor affecting mobility of actinides identified by the Clemson University studies (Fjeld, Coates, and Elzerman 2000) is the effect of organic complexing agents. Laboratory tests using EDTA, an organic complexing agent, showed that EDTA could greatly enhance the mobility of actinides. An inventory of complexing agents (e.g., EDTA) used at RFP (INEEL 1998) indicates that organic complexing agents are likely to be present in the waste. The quantities of EDTA from RFP are reported as unknown, but a reasonable upper limit of 7.1E+04 kg is suggested in the HDT (LMITCO 1995a, Table 4-1). [3-109] [207] [emphasis added]

Section XIII. Measurable CERCLA Cleanup Objectives Missing

DOE's RWMC "Measurable performance objective [is] based on limiting the effective dose equivalent rate at the surface …in transition to long-term stewardship. The [Record of Decision] ROD identified EPA's recommended protectiveness criterion of 15 mrem/year effective dose equivalent rate (EPA 1997) as a measurable objective for future engineered surface barrier. Subsequently EPA reduced the recommended value to 12 mrem/yr. (EPA 2014)." Why is this "dose value" three times the EPA regulations of 4 mrem/year for other radiation exposures?

The Environmental Defense Institute (EDI) believes that DOE's Remedial Investigation/ Feasibility Study for the RWMC/SDA is grossly inadequate in waste characterization, therefore, the Risk Assessment and proposed Plan for cleanup of the buried waste is subsequently deficient. [208]

"Much of the LLW and TRU waste disposed of in the SDA during this period is **mixed waste:** waste containing both radioactive and hazardous chemical components as defined by the Atomic Energy Act and RCRA, respectively." "Contaminants are often identified through a sampling and analysis program. Drilling, sampling, and analysis to determine an appropriate SDA inventory is not considered feasible or practical for several reasons: (a) the area is quite large, (b) drilling into disposal units containing radioactive waste is hazardous, and (c) the contaminants are distributed unevenly over the area in concentrated and dilute form. Even a massive drilling and sampling campaign would not result in an inventory in which high confidence could be placed because of the heterogeneity of the waste." [209] [2-1]

[206] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment ,May 14, 1993, Section 4.7.2.2.

[207] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002, Pg. 3-109

[208] See Citizens Guide to INL; http://environmental-defense-institute.org/publications/GUIDE.963.pdf

[209] ibid. INEL-95/0310, Pg.2-1.

"The year 1983 was selected as the cutoff point for the portion of the inventory that is reported here based on the following rationale. One particular waste stream filters from the Waste Calcining Facility at the INEL) that might not have complied with current waste acceptance criteria was disposed of at the SDA as late as 1983. With only a few exceptions, which are described in LITCO (1995), waste disposed of after 1983 complied with the acceptance criteria." "The estimated H-3 [tritium] activity is approximately 20 times larger than the RWMIS value, due primarily to the identification of a major TRA waste stream with approximately 1 million Ci of H-3 entrapped in beryllium." [Ibid.] The SDA also contains significant quantities of beryllium, a carcinogenic metal widely used in INL reactors.

> "The test reactors were the major generators of nonradiological contaminants in [Test Reactor Area]TRA waste sent to the RWMC. The primary contaminant is beryllium. This waste is generated when a reactor reflector is replaced." "Assumptions and analysis**.** The mass of beryllium sent to the RWMC was correct on the shipping records, as confirmed by the calculations of Nagata (1993). The radioactivity 2-48 was based on results in Nagata (1993). Nagata's method for estimating the tritium activity in the reflectors was based on Tomberlin's calculation of the tritium generation rate per unit volume of beryllium. Although disposal of the reflectors occurred between 1969 and 1977, generation of the tritium in these reflectors was occurring fairly steadily from about 1963 through 1977. The reflectors were in the reactors and in storage canals at the reactor facilities for various periods of time before being shipped for disposal. In the absence of readily available, detailed histories of each reflector, the simplifying assumption was made that the tritium (and other radionuclides) produced in the reflectors was generated at a uniform rate from 1963 through 1977. [210]

Because of inadequate waste characterization, the Environmental Defense Institute only supports the Agencies Plan Alternative No. 5; Full Retrieval, Treatment, and Disposal in a fully permitted non-Idaho geologic repository. [211] EPA consultants state; "The only technology that actually reduces the amount of actinide [TRU] in the pits and trenches is the Remove/Treat/ Dispose option. This option requires sufficient characterization to determine where the principal threat wastes are located. " [212] The fact that the RWMC lies in a flood zone disqualifies it under Nuclear Regulatory Commission Land Disposal and EPA Land Disposal regulations any alternative that leaves waste in place in this shallow burial dump; not to mention the tragic fact that this dump would not even qualify for a simple EPA Subtitle D municipal garbage landfill. The tragic irony is – this dump is (as of this writing) still accepting low-level radioactive waste for burial. Also the extensive costs of setting up the ARPs (~$900,000) without removing all the listed waste and dismantling the buildings with no intension of returning, is a bigger tragedy. This represents the cost the federal government policy makers in Washington put on Idaho's sole source aquifer that if Idahoans knew – they would be very angry.

Alternative 5 that would remove "all" the buried transuranic/plutonium/alpha, is dismissed by the agencies for incorrect and inappropriate reasons. This alternative is what the public was promised in 1995 and the Settlement Agreement promised; because it would have removed "**at least 65,000 cubic meters of buried TRU**", **remove the rest of the buried plutonium identified in the Settlement Agreement as "low level alpha**." Now DOE wants to limit 36 ac. SDA waste retrieval to "targeted waste retrieval of a minimum **volume of 6,238 m3** from a minimum of 5.69 acres." DOE's concern continues to be overfilling Waste Isolation Piolet Plant (WIPP) TRU repository in New Mexico. WIPP is currently backlogged getting shipments certified and interned into the converted salt mine. An explosion/fire inside the mine forced the closure due to shipment violations from DOE's LANL site until investigations/ remediation were

[210] ibid. INEL-95/0310, Pg. 2-48

[211] Nuclear Criticality Safety Issues Pertaining to the INL SDA; J.A McHugh, R.A. Knief, and M.A. Robkin, 5/3/2000

[212] J. Roland ,Need for Physical Samples at Idaho National Laboratory Subsurface Disposal Area Pits and Trenches, December 2000, J. Roland, GF; V. Rhoades, GF; R. Poeton, EPA-10; Pierre, EPA-10.

concluded so WIPP could reopen. New Mexico Department of Environmental Quality (NMDEQ) has implemented restrictions on surface storage which means INL is limited in shipments to WIPP. The risk of leaving this waste (including the contaminated soil “underburden”) in place shows how inadequate the CERCLA cleanup objectives are aggravating the continuing migration into the vadose zone and underlying aquifer as the tables below show. Tami Thatcher’s articles on INL cleanup. [213]

Table 10-5 below shows the waste types, concentration, compared to EPA’s maximum contaminate level (MCL) in surface storage Pad A that will remain in place to continue add contaminates to the aquifer.

Table 10-5. Summary of analytes detected at reportable levels in Zone 1 (Pad A) during Fiscal Years 2010–2014. [214]

Analyte	Number of Sample Points	Number of Analyses[a]	Number of Reportable Detections	Maximum Concentration[b]	MCL	Units	Detections Greater Than MCL[c]
Cl-36	13	49	1	16 ±5	700[d]	pCi/L	0
C-14	12	86	1	37 ±9	2,000[d]	pCi/L	0
Nitrate (as nitrogen)	9	21	8	**119[e]**	10	mg/L	8
Selenium	2	2	1	**70.3[e]**	50	µg/L	1
Tc-99	13	111	5	**15,700 ±904[e]**	900[d]	pCi/L	4
Tritium	3	9	9	**964,000 ±95,300[e]**	20,000[d]	pCi/L	9
U-233/234	7	17	11	90 ±8	NA[f]	pCi/L	NA[f]
U-235/236	7	17	3	5.5 ±1	NA[f]	pCi/L	NA[f]
U-238	7	17	10	24 ±2	NA[f]	pCi/L	NA[f]
Uranium (total)	13	49	24	**67.1[e] J[g]**	30	µg/L	11

a. Includes field duplicates.
b. Radionuclide concentrations include an uncertainty of ±1σ.
c. MCLs are from “National Primary Drinking Water Regulations” (40 CFR 141). Though soil moisture and perched water are not sources of drinking water, MCLs are used as convenient and familiar values for comparison.
d. The given value is derived from the MCL for gross beta of 4 mrem/year based on the concentration of a single isotope yielding a dose of 4 mrem/year to the total body or to any critical organ. 40 CFR 141 establishes an MCL of 4 mrem/year for beta particle and photon radioactivity, provides derived values for Sr-90 and tritium, and indicates how other derived values should be calculated.
e. **Bold** font indicates a sample concentration that exceeds the MCL.
f. The uranium MCL applies to total uranium and not to individual uranium isotopes.
g. The “J” data qualifier flag indicates limitations associated with the result. The reported concentration is an estimate.

MCL maximum contaminant level
NA not applicable

[213] *Potential Un-reviewed Safety Question Affecting Department of Energy Complex Concerning Hydrogen Generation in TRU Waste Drums*. Also; *Radiation Workers at the Idaho National Laboratory and Around the DOE Complex Need to Understand Blood Count Changes That Can Indicate a Significant Radiation Exposure*. http://www.environmental-defense-institute.org/edipubs.html

[214] DOE/ID-11513, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site-Fiscal Years 2010–2014 December 2015 DOE/ID-11513 Revision 0.

"ARP I Underburden: ARPU0801VA List Constituent Result Analytical Method"
[i.e. CONTAMINATED SOIL UNDER WASTE]

2ARN1801GR	5/20/2008	NTW 250-ml	AA-3	
	Constituent	**Result**		**TRU**
	Americium-241	1.06e+06 pCi/g		1.06e+03 nCi/g
	Europium-152	7.75e+01 pCi/g		3.38e+03 nCi/g
	Plutonium-239	3.38e+06 pCi/g		
				4.44e+03 nCi/g

"10.6.1.2 Vadose Zone Vapor Monitoring**.** Downward vapor-phase transport from buried waste through the vadose zone to the aquifer is the most likely transport process for the carbon tetrachloride and other VOCs observed in aquifer wells near RWMC (Holdren et al. 2006). OU 7-13/14 monitors VOC vapors in the vadose zone to track progress towards remediation goals defined for two zones in the subsurface (Figure 10-4). Within Region A and Region B, inside and outside the SDA, respectively, zones are referred to as A0, A1, A2, A3, B0, B1, B2, and B3 based on lithology as described above for vadose zone soil moisture and perched water monitoring (Figure 10-5)." [215] [emphasis added]

Table 10-7. Sum. analytes detected at reportable levels in the aquifer during Fiscal Years 2010–2014. [216]

Analyte	Number of Analyses[a]	Number of Reportable Detections	Maximum Concentration[b]	MCL	Units	Detections Greater Than MCL[c]
Arsenic (unfiltered)	109	1	**26.3[d]**	10	µg/L	1
Cl-36	124	4	115 ±16	700[e]	pCi/L	0
C-14	124	1	9.4 ±1.3	2,000[e]	pCi/L	0
Carbon tetrachloride	126	54	**7.01[d]**	5	µg/L	9
Chromium (unfiltered)	109	1	**114[d]**	100	µg/L	1
Gross alpha	126	1	**16 ±2J[d,f]**	15	pCi/L	1
Gross beta	124	2	**23 ±2[d]**	8[g]	pCi/L	2
Nitrate (as nitrogen)	126	1	2.35	10	mg/L	0
Trichloroethylene	126	28	3.01	5	µg/L	0
U-233/234	124	1	1.9 ±0.17	NA[h]	pCi/L	NA[h]
U-238	124	2	0.89 ±0.17	NA[h]	pCi/L	NA[h]

h. Includes field duplicates.
i. Radionuclide concentrations include an uncertainty of ±1σ.
j. MCLs are from "National Primary Drinking Water Regulations" (40 CFR 141).
k. **Bold** font indicates a sample concentration that exceeds the MCL.
l. The given value is derived from the MCL for gross beta of 4 mrem/year based on the concentration of a single isotope yielding a dose of 4 mrem/year to the total body or to any critical organ. 40 CFR 141 establishes an MCL of 4 mrem/year for beta particle and photon radioactivity, provides derived values for Sr-90 and tritium, and indicates how other derived values should be calculated.
m. The "J" data qualifier flag indicates limitations associated with the result. The reported concentration is an estimate.
n. The derived MCL for Sr-90 (8 pCi/L) was applied for reporting of gross beta concentrations during FY 2010-2013. As of FY 2014, the regional background concentration of 7 pCi/L is used as the reporting threshold (Forbes and Holdren 2014).

[215] Ibid., DOE/ID-11513, Section 10.6.1.2 Vadose Zone Vapor Monitoring
[216] Ibid., DOE/ID-11513, Pg. 10-20

Table 10-6. Summary of analytes detected at reportable levels in Zone 2 during Fiscal Years 2010–2014. [pg. 10-16] [217] [218]

Analyte	Number of Sample Points	Number of Analyses[a]	Number of Reportable Detections	Maximum Concentration[b]	MCL	Units	Detections Greater Than MCL[c]
C-14	11	76	2	59 ±13	2,000[d]	pCi/L	0
Chromium (unfiltered)	2	7	3	**930**[e]	100	µg/L	3
Nitrate (as nitrogen)	7	21	17	**88**[e]	10	mg/L	12
Tc-99	12	102	1	34 ±11J[f]	900[d]	pCi/L	0
U-233/234	4	13	12	85 ±10	NA[g]	pCi/L	NA[g]
U-235/236	4	13	2	1.3 ±0.4	NA[g]	pCi/L	NA[g]
U-238	4	13	11	27 ±4	NA[g]	pCi/L	NA[g]

DOE's wish that VOC vapor extraction of SDA will be successful even after a decade of operation there new estimate of VOC is 6 times more in volume than previously thought.

"The OU 7-08 ROD (DOE-ID 1994a) lists CCl_4, PCE, TCE, and 1,1,1-TCA as COCs but only lists a cleanup goal for CCl_4, because successful treatment of CCl_4 will also reduce the other COCs. The original estimated volume of CCl_4 buried in the SDA was 325,000 lb., but that estimate was revised to 1,800,000 lb. in the spring of 2001 based on additional information obtained from the Rocky Flats Plant." [10-1] [219] [emphasis added]

"10.1.4 Technical Assessment "Question A: *Is the remedy functioning as intended by the decision documents?*
"Based on monitoring results, concentrations of contaminants are decreasing in the vast majority of the vadose zone monitoring points, especially above the B-C interbed (i.e., ~110 ft bless), where most of the extraction has occurred. Reductions in concentrations have been most steady in areas located away from source zones. Groundwater monitoring currently indicates two of 20 wells in the RWMC area (M7S and the RWMC production well) are above the MCLs for CCl_4. Some of the wells continue to show a slightly increasing trend in CCl_4 concentrations, while others indicate a flat or decreasing trend." [220] [emphasis added]

"10.2.2.9 Underburden [soil under waste] Sampling. The core sampling performed was intended to characterize contaminants of interest in the underburden and to support subsequent evaluations of the potential for contaminant migration.
"Results in the Remedial Action Report (DOE-ID 2004b) confirm that the presumed underburden contains high levels of TRU contaminants with two subsamples exhibiting Pu-239 concentrations greater than 100 nCi/g. Preliminary evaluation of the relative abundance of TRU elements within these subsamples suggests that this contamination most likely resulted from mixing of waste and underburden soil during waste retrieval. Variations in the relative abundance of Pu-239 and Am-241 from subsamples are suggestive of chemical transport processes." [221] [Pg.10-25] [emphasis added]

[217] Ibid., DOE/ID-11513, Pg. 10-16.
[218] Ibid., DOE/ID-11513, Pg. 10-17.
[219] Ibid., DOE/ID-11513, Pg. 10-1.
[220] DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory, Revision 3, February 2007
[221] Ibid., DOE/NE-ID-11201, Pg. 10-25

Given all these problems at WIPP it's ridiculous for DOE to send more waste to INL for "processing" for eventual shipment to WIPP. Most of DOE sites (like Hanford) wanting to ship waste to INL have the capacity to "process" waste bound for WIPP directly without passing the waste off to INL. Primary exposure Pathways are numerous as shown below:

Radionuclide	Peak Risk[a]	Year	Primary Exposure Pathways[a]
Americium-241	3E-03	2594	External exposure, soil ingestion, and inhalation
Carbon-14	1E-05 (0.1 in 10,000)	2110	Groundwater ingestion and inhalation of volatiles (at the
Cesium-137	2E-03	2110	External exposure and crop ingestion
Lead-210	3E-05	3010	Crop and soil ingestion
Plutonium-239	3E-03	3010	Soil ingestion, crop ingestion, and inhalation
Plutonium-240	6E-04	3010	Soil ingestion, crop ingestion, and inhalation
Radium-226	7E-04	3010	External exposure and crop ingestion
Radium-228	3E-05	3010	External exposure
Strontium-90	1E-03	2110	Crop ingestion, external exposure, and soil ingestion
Technetium-99	5E-05 (0.5 in 10,000)	2858	Groundwater ingestion and crop ingestion (crops irrigated with contaminated groundwater)

a. All exposure pathways that could pose risk are assessed in the Remedial Investigation and Baseline Risk Assessment those contributing most to risk are listed as primary exposure pathways.

Chemical	Peak Risk[a]	Year	Peak Hazard Index[a]	Year	Primary Exposure Pathways[a]
Carbon tetrachloride[b]	4E-04 (4 in 10,000)	2117	10	2119	Inhalation of volatiles (at the ingestion
1,4-Dioxane[b]	2E-05	2110	NA	NA	Groundwater ingestion
Tetrachloroethylene[b]	4E-04 (4 in 10,000)	2136	<1	2136	Groundwater ingestion and
Trichloroethylene[b]	2E-05	2141	NA	NA	Groundwater ingestion

a. All exposure pathways that could pose risk are assessed in the Remedial Investigation and Baseline Risk Assessment[11]; those contributing most to risk are listed as primary exposure pathways.
b. Chemicals contained in organic solvent waste. [222]

The extensive probing of the limited designated SDA pits/trenches DOE thought TRU waste was dumped, its reports show waste that definitely should be removed but were not under any of the ARPS I, II, III, IV, V, VI, VII ,VIII or IX. Attachment A to this report are only two pages of the >30 pages of probe test results

[222] DOE/ID-11359, Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14, *Revision 0 September 2008*, DOE/ID-11359, Pg. 21.

that are an exemplar of waste missed in DOE's Remedial Action for Operable Unit 7-13/14 Targeted Waste Retrieval Program. Waste such as "irradiated fuel material, activated metals and enriched uranium." Attached in EDI comments (Appendix A) show the correlating locations within the SDA were these samples were taken. DOE has never intended to commit to clean-up its gross mismanagement of its legacy radioactive waste dumping. Every attempt by Idaho Governors to protect our sole-source aquifer; to force DOE to appropriately deal with this terrible environmental disaster - via EISs, Settlement Agreements, Court Orders and cleanup agreements, DOE manages to slither around doing the right thing in cleanup.

To demonstrate how deficient the SDA Waste Retrieval Project is, we offer a few samples in Table 1 below of probe samples below that show highly enriched uranium and spent nuclear fuel locations that are NOT included in the Retrieval Project (i.e., not under any of the listed ARPS).

> **PERFORMANCE STANDARDS AND CLEANUP GOALS**
>
> "The ROD for OU 7-13/14 states that: "completion of targeted waste retrieval will be measured by the volume of targeted waste retrieved. A minimum volume of 6,238 m3 of targeted waste (as disposed of) will be retrieved from a minimum of 5.69 acres, with the need for additional retrievals, if necessary, determined pursuant to CERCLA (see Section 1.2.3.2).
>
> "Cumulatively, ARPs I through VII have exhumed waste from 3.28 acres and packaged 6,043 m3 (29,053 fifty-five-gal drums) of targeted waste that count toward the performance goal (i.e., excluding 0.02 acres and 34.528 m3 from ARP I Adjacent, 0.208 m3 from Grid A-8 adjacent to ARP VI, and 0.832 m3 in overages generated by reworking drums). Retrieval areas are 0.50 acres for ARP I (excluding ARP VI Row A and ARP I Adjacent), 0.34 acres for ARP II, 0.43 acres for ARP III (including 0.38 acres for ARP III Accessible and 0.05 acres for ARP III Vestibule), 0.79 acres for ARP IV, 0.55 acres for ARP V, 0.40 acres for ARP VI (including Row A retrieved under ARP I), and 0.27 acres for ARP VII."
>
> "Performance standards and cleanup goals for ARPs completed to date have been satisfied since excavation of the specified retrieval area for each ARP is complete; however, the performance goal with respect to the minimum volume to be retrieved will not be assessed until all retrieval areas are complete, at which time the cumulative targeted waste volume retrieved will be evaluated against the minimum waste volume of 6,238 m3 of targeted waste (as disposed of), as stipulated in the ROD. Compliance shall be measured as 7,485 m3 of targeted waste packaged for shipment out of Idaho. Grand Total $673,903,730 ." [223] [ICP-EXT-05-00784, pg80+81]

The importance of the tables below are that they show specific examples of the SDA probe results of areas not included in the Advanced Retrieval Project (ARPS) temporary buildings built over select areas that do have waste needing to be retrieved. EDI's cursory review of limited access to documents covering the retrieval operation. [224]

It's tragic that all the expense required setting up these 9 ARPS in the SDA and not actually retrieve all of the RCRA listed mixed hazardous/radioactive that normally EPA's Land Disposal Restrictions would prohibit. Moreover, DOE cannot legally dig around this waste without treating it as "new" waste that cannot be dumped in a non-compliant Subtitle C mixed hazardous/radioactive facility. Again, DOE was forced to build a compliant/permitted CERCLA Subtitle C mixed hazardous/ radioactive waste facility near the Advanced Reactor Test Complex only 10 miles north of the RWMC that can receive the SDA waste that is not slated for WIPP or do not meet the INL Idaho CERCLA waste facility acceptance criteria. Also see Attachment A to this report that shows more details on this issue.

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[223] ICP/EXT-05-00784, Final Report for the Waste Area Group 7 Probing Project, Idaho Cleanup Project,

[224] ibid. ICP-EXT-05-00784, pg. 80+81.

Air Pathways for the RWMC missing in Remediation Plan as shown below:

"4.7.4.1 Facility Description air pathways for the RWMC: OU 7-04 consists of the air pathways for the RWMC. Suspected contaminants include radioactive and non-radioactive hazardous materials. Air monitoring for particulate radionuclides is currently conducted as part of a regular monitoring program at the RWMC. No regular monitoring is conducted for non-radioactive materials. Potential sources for air contaminants include the active pits, TRU waste, TRU mixed waste, and low-level mixed waste and hazardous waste buried in the pits and trenches, and liquid wastes poured into selected pits at the RWMC**.** Soil gas surveys taken during a screening for 13 compounds have identified 1,1,1-lrichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, and chloroform."

"4.7.4.2 Waste Type. The materials of concern in this OU are airborne volatile organics and radioactive particulates resulting from various sources located in the soil and/or ground water. Table 4.7-7 lists estimates of various hazardous materials that were disposed of in the RWMC SDA that may add to the materials being released through the air pathway.

Table 4.7-7 Estimated Hazardous Materials Disposed in the RWMC

Material	Volume Cm3)	(gallons)
Rages	128	NA
Oil (in absorbent)	89	23,400
Lead	170	NA
Asbestos/lagging	100	NA
Ethylene glycol	1.5	390
Mercury	8.5	2,240
Acids (in absorbent)	38	10,200
Organics (ether etc.)	25	6,700
Santo Wax	200	53,700

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Materia	Volume	Volume (Gallons**)**
Sodium, compounds and pipes	105	27,600
Batteries	0.5	NA
Benzene	0.1	20
Animal carcasses/feces	71	NA
Vehicles	24	**NA**
Cyanide	<0.01	**NA**
Meat w/botulinus	0.05	**NA**
Tritium vials	2	**NA**
Zirconium chips	30	**NA**
Caustic compounds (NaOH in absorbent, etc.)	26	**NA**
Paint chips and cans	6	1,600
Gasoline (absorbed)	5	1,300
Ammonia bottles	0.2	**NA**
Thallium oxide	<0.1	**NA**
TRU Texaco Regal Oil	128	39 018
TRU carbon tetrachloride	92	24,413
TRU other organics	94	24 968

DOE's CERCLA cleanup objectives also fail to consider flooding as previously discussed in Section IV in this report but must be reemphasized as the below Environmental Restoration Program Assessment states:

"Surface water near the SDA is confined to the Big Lost River, which passes less than two miles north of SDA. The only surface water in the immediate SDA area occurs as runoff during heavy rains or snow melt. Flooding

225 Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment, May 14, 1993

> has occurred three times in recent years, in 1962, 1969, and 1982. During the 1962 flood, trenches 24 and 25, and pits 2 and 3 were opened and filled with water. In 1969, Pits 8 through 10 and Trenches 48 and 49 filled. And in 1982, flood water entered Pit 16 and trenches 42 and 49. Inventories indicate that the pits and trenches flooded contained radioactive, hazardous, and mixed waste. Typically the waste is in drums and boxes. Actual inventory lists for these pits and trenches are contained in the following documents: EDF- BWP-4, EDF-BWP-12, EDF-103, UORs EGG-82-8and EGG-82-10, ID0-10054(81), WMP-77-3, and PR-W-80-015 (Rev. 1)."
>
> "Sampling after the 1982 overflow had only one sample showing a beta/gamma count rate greater than that allowed under DOE regulations for releases to uncontrolled areas. Most of the water entering the SDA during the flooding infiltrated the soils rather than dispersing via evaporation, transpiration or drainage." [Pg. 4.7-15]
>
> "Recent Track 2 investigations for OU 7-05 collected radionuclide data from the drainage and ponding areas where existing data is not available. Radionuclides that have previously been detected at the site are: ^{239}Pu, 238pu, 241Am, 137Cs, and 90Sr. The majority of soil samples taken during this investigation had activities below the detection limits of 0.1 pCi/g for gamma emitting radionuclides (e.g., 137Cs, 60Co) and 0.03 pCi/gm for alpha emitting nuclides (e.g., Pu, Am). Uranium and thorium isotopes were detected, but at levels below those found in INEL background soils. [Pg. 4.7-15]
>
> <u>"4.7-9 Table 4.7-5 shows irradiated reactor fuel in Trenches (25, 27, 28, 30, 31, 33, 35, 40, 41, 42, 43, 46, 52, 54) and enriched uranium dumped in Trench 49.</u> [emphasis added]
>
> "4.7.4.5. Volume of Waste Requiring Disposal**.** The compounds that are volatilizing; md proving to be a risk via the air pathway can be destroyed via thermal treatment (catalytic oxidation or regeneration of GAG. Thus no final waste product will be generated. (GAC might be considered a waste product, however since it can be regenerated, it is not considered as a waste." [Pg.4.7-14] [226]

DOE's CERCLA cleanup objectives also fail to consider the serious health impact of inhalation of tiny amounts as Figure 4.1-2 below shows and as previously discussed in Section IV in this report but must be reemphasized as the below Basis for Risk Analysis states:

> Figure 4.1-2 emphasizes the severity of plutonium inhalation in comparison to other radiation exposures. Inhalation of one microgram (one-millionth of a gram) of plutonium results in a cumulative lifetime dose 6.7 million times greater than the cumulative lifetime dose that would be received from one microgram of depleted uranium from Rocky Flats Trench-1; this dose would also be four times the DOE annual dose limit. Therefore, the plutonium contaminated waste materials at OU 7-10 cannot be handled and packaged in the same manner used for uranium waste materials at the Rocky Flats Trench-1 operation. [4-4] [227]

Tami Thatcher reported on INL cleanup issues at the RWMC/SDA about searching for the reasons why four transuranic waste drums ruptured in April 2018, just hours after being repackaged. She came across a report published in 2002 that seemed to provide important clues for the rapid drum over pressurization. The four waste drums had been repackaged by Fluor Idaho, the operating contractor for the Idaho Cleanup Project, under the Department of Energy at the Idaho National Laboratory site. Tami also reports on INL worker exposure "That Can Indicate a Significant Radiation Exposure." [228]

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[226] Draft Idaho National Engineering Laboratory EIS Environmental Restoration Program Assessment, May 14, 1993, Section 4.7.2.2 Waste Type

[227] INEEL-EXT-02-01125, Ancillary Basis for Risk Analysis of the Subsurface Disposal Area September 2002, Pg. 4-4

[228] *Potential Un-reviewed Safety Question Affecting Department of Energy Complex Concerning Hydrogen Generation in TRU Waste Drums*. Also; *Radiation Workers at the Idaho National Laboratory and Around the DOE Complex Need to Understand Blood Count Changes That Can Indicate a Significant Radiation Exposure*. http://www.environmental-defense-institute.org/edipubs.html

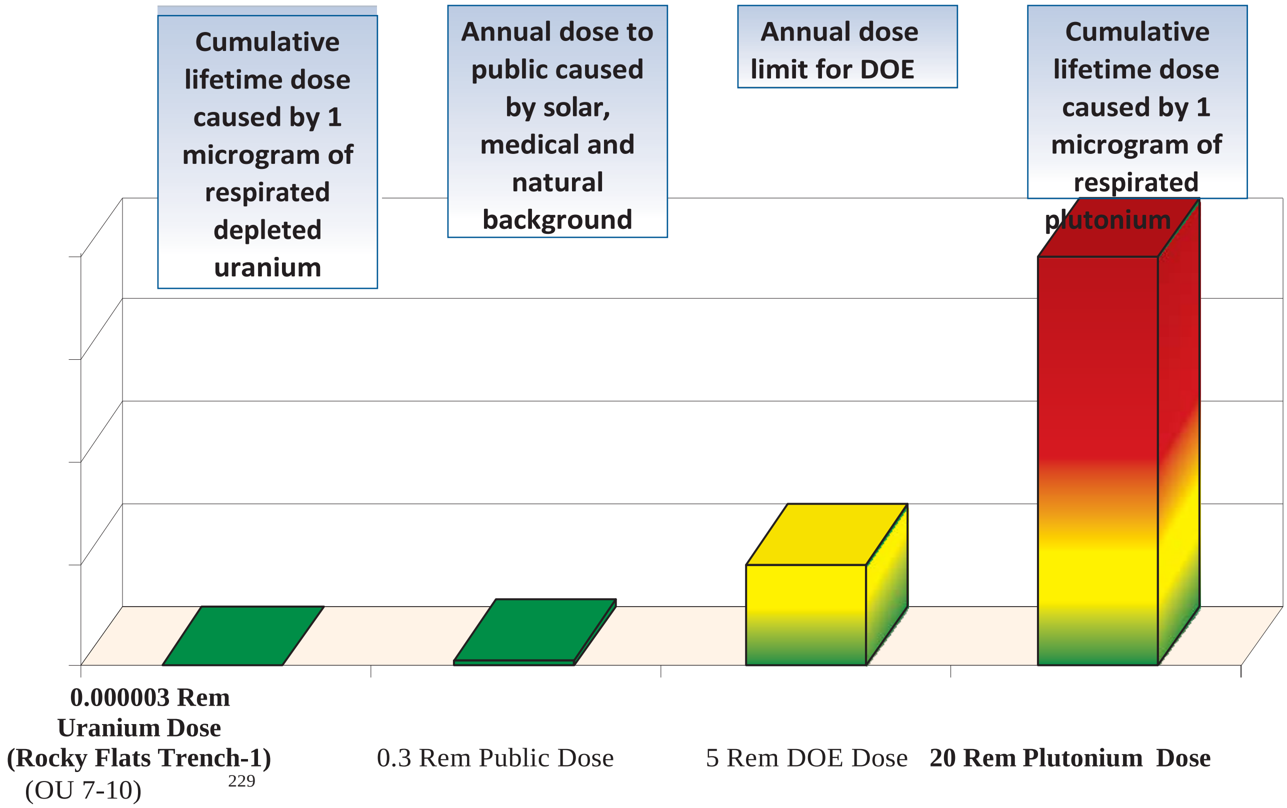

Figure 4.1-2. Radiological Exposure Hazards of Plutonium Versus Depleted Uranium. *Radiation exposures caused by inhalation of plutonium are 6.7 million times greater than equivalent exposures of depleted uranium—internal exposure of only 1 microgram of plutonium exceeds the allowable exposure limits established by DOE.*

Air dispersion of contaminates 2,500 meters from SDA was never seriously considered in CERCLA remediation evaluation and the below monitoring data documents show:

> "The work of Markham et al. (1978) indicates 241 Am, 230 Pu, and 238 Pu were detected at maximum distances of approximately 2,500 m, 2,400 m, and 1,000 m respectively from the SDA (Figure 2). The Am and Pu analyses were performed using a potassium fluoride and pyrosulfate [sic] fission method. Maximum concentrations in surface soils (0-4) cm of 51 pCi/g (2,048 nCi/m^2 241 Am, 36.5 pCi/g (1,377 nCi/m^2) 239 Pu and 0.8 pCi/g (32 nCi/m^2) 238 Pu were observed in the SDA perimeter drainage: however little contamination was detected in the SDA main drainage channel at a distance of approximately 200m (4.85 nCi 248 Am/m^2 , 2.05 nCi 239-Pu/m^2 and 0.10 nCi 238Pu/m^2 or beyond from the SDA (Markham et al., 1978). The highest surface soil concentrations detected outside the RWMC perimeter drainage were 8.4 pCi/g (401 nCi/m^2) 241 Am, 2.6 pCi/g (122 nCi/m $^{2)}$ 239Pu, and 0.06 pCi/g (3 nCi/m^2) 238 Pu.
>
> "The investigation of Markham (1978) detected activation and fission nuclides beyond SDA. Using *y* – spectrometry [gamma], 137Cs, 60Co, and 90Sr were detected in most surface soil samples (Figure 3). Radionuclide concentrations neared INEL background levels beyond a distance of 350 m from the SDA. The maximum 137 Cs concentration detected was 16.1 pCi/g, about twelve times the average background value. The average concentration detected for 137Cs was 4.2 pCi/g (173 nCi/m^2) or about three times the average background value. Concentrations of 60Co averaged 2.3 pCi/g (93 nCi/$m^{2)}$ or 230 times greater than the minimum detection limit for 60Co. A maximum surface soil concentration of 11.3 pCi/g was measured for 60 Co. The average concentration of 90Sr was 6.8 pCi/g (279 nCi/m^2) or

[229] INEEL/EXT-01-01105, Waste Area Group 7 Analysis of OU 7-10 Stage II Modifications October 1, 2001

fifteen times the average background concentration in surface soils a maximum value of 26 pCi/g was measured for 90Sr." [Pg.4] [230] [emphasis added]

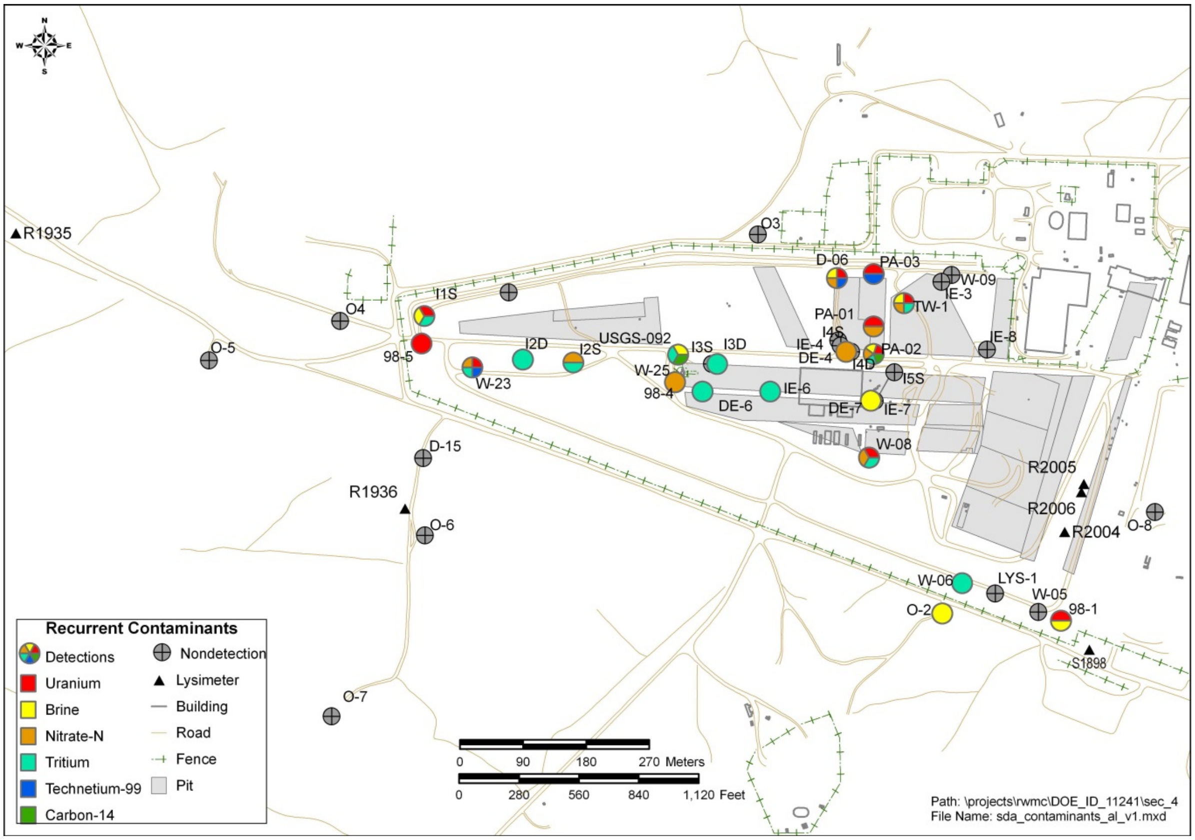

Figure E-3. Recurring constituents in vadose zone lysimeters.

DOE problems with redefining TRU from the original definition in 1970 of 10 nCi/g to the current definition of >100 nCi/g are discussed below:

"In almost all cases, significant additional (intrusive) characterization of the buried TRU-contaminated waste sites would be necessary to provide more detailed information. Whether the effort to obtain such information is worth the costs and potential health and safety risks is evaluated by DOE and regulatory agencies on a site-specific basis.

"In responding to the data call, Field Offices used all available information to develop as complete a response as was possible. While information within a site response is consistent, it was not always possible to obtain complete consistency among sites. For example, Hanford was not able to provide separate estimates for the volumes of αLLW. In contrast, INEEL could only provide estimates for the waste volumes having TRU radionuclide concentrations in excess of 10 nCi/g, without dividing this estimate into the fraction greater than 100 nCi/g and that between 10 and 100 nCi/g. The inability to provide finely discriminating volume estimates based on the concentrations of TRU radionuclides is not surprising in view of the way in which TRU waste thresholds were defined, i.e., as "floors." [231] [pg.19]

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[230] EGG-WM-10090, Sampling and Analysis Plan for RWMC Subsurface Disposal Area, EG&G Idaho April 1992 , Section 1.4.1.1 Existing Data. Results of previous investigations (Markham, 1978: Markham, et al., 1978) indicate radionuclides have transported beyond the DSA boundary (Figures 2 and 3), Pg.4.

[231] The *Buried Transuranic-Contaminated Waste and Related Materials Database* includes entries in narrative fields to fully document the bases of the estimates. [pg.19]

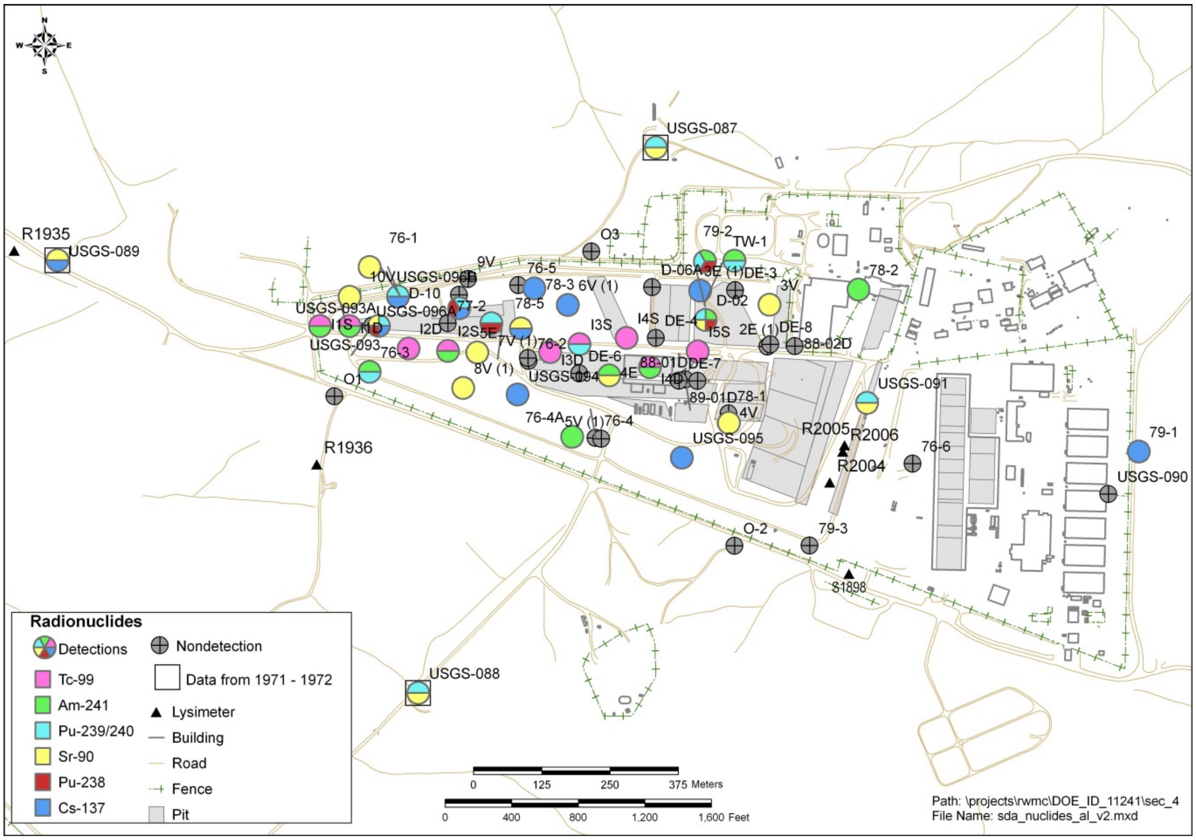


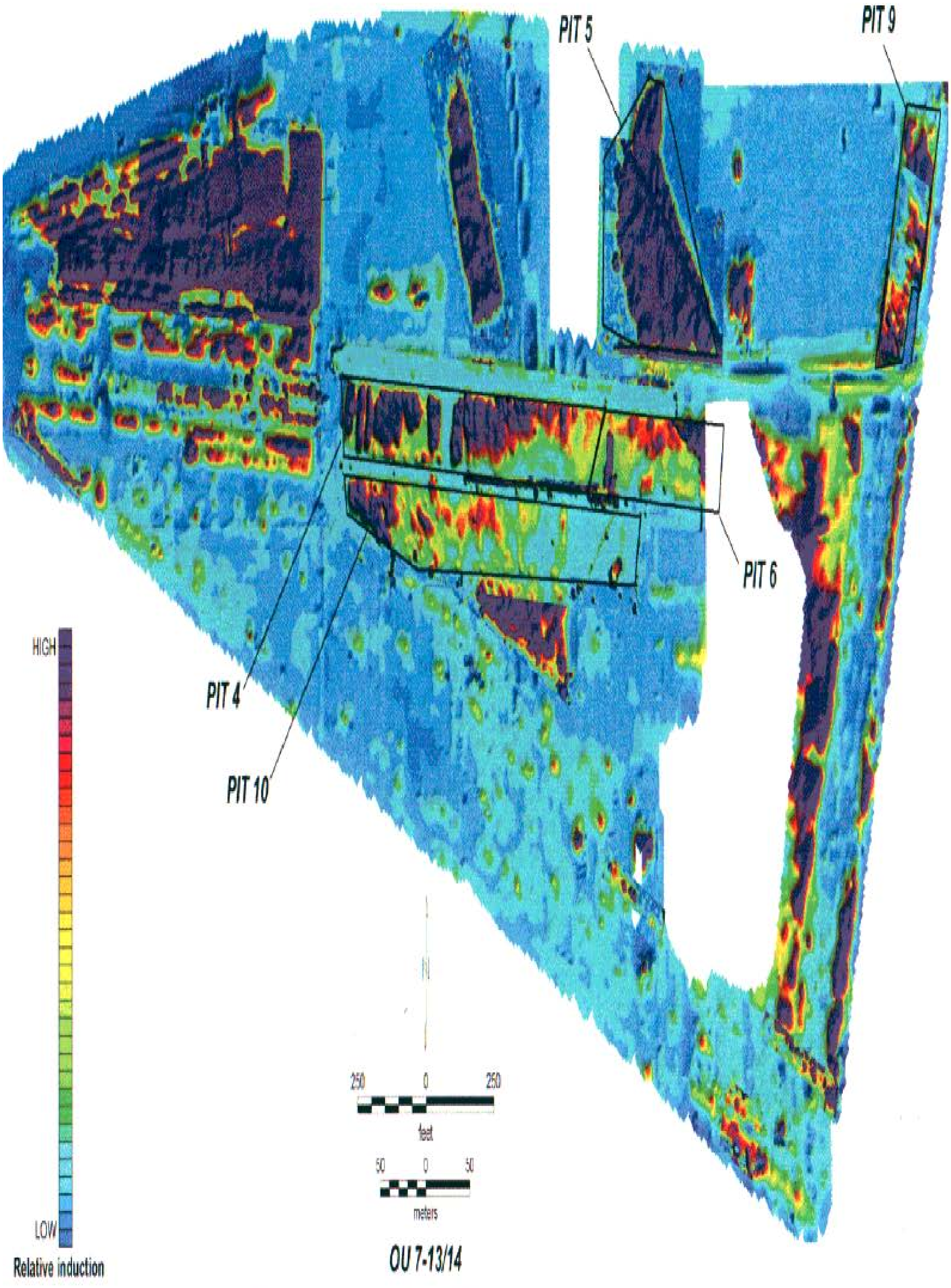
Figure E-4. Radionuclides detected in core samples between 1971 and 2003.

DOE's own reports criticize the very CERCLA programs evaluation of the data collection in the retrieval process.

> "The assessment report by Auxier & Associates of Knoxville, Tennessee dated July 25, 2001 (Appendix A) focuses on risk-based approaches to retrieval <u>but ignores the agencies' demand for extensive data collection during retrieval and the robustness needed to accomplish multiple relocations of the Stage II retrieval system."</u>
> _"No consideration was given of actual risks and how to reduce them with simple means. Two retrieval study reports (Thompson 1972, McKinley 1978) show that retrieval is possible with little contamination spread. The reports note that some waste forms and condition of waste forms could result in contamination spread if improperly handled. No consideration was given to using the same techniques of the two reports with modification to prevent contamination spread." [232] [emphasis added]

The below graph shows the radiological survey of the RWMC/SDA and the relative hot-spots.

[232] Waste Area Group 7 Analysis of OU 7-10 Stage II Modifications, Pg. 4-6


PIT 5
PIT 9
PIT 6
PIT 4
PIT 10
HIGH
LOW
Relative induction
N
250 0 250
feet
50 0 50
meters
OU 7-13/14

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B. L. Anderson et al., Hydrogen Generation in TRU Waste Transportation Packages, NUREG/CR-6673, UCRL- ID-13852, Lawrence Livermore National Laboratory, February 2000, https://www.nrc.gov/docs/ML0037/ML003723404.pdf p. 77.

Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, June 2000 #1. The issue of contaminated soil removal in a remediation site this report gives a relevant example:

> "Additional TRU-Contaminated Waste and Soil: "Finally, soil in the Miami-Erie Canal at the Mound Environmental Management Project in Miamisburg, Ohio, was contaminated with plutonium-238 as a result of an accident in which liquid wastes were released to the canal in 1969. The volume of TRU-contaminated soil was estimated as 288 m3 in 1992 (DOE 1992). The Miami-Erie Canal has recently been remediated (the removal action was completed in May 1998). The selected remedy consisted of removing soil to a specified cleanup level that was developed in consultation with stakeholders (75 pCi/g or 0.075 nCi/g) and disposing of it off-site as LLW, as the average plutonium concentration in this soil was well below 100 nCi/g. A total of about 29,000 m3 of soil was removed from the canal area. Included in this excavated soil was the amount previously identified as being TRU-contaminated."

Buried TRU at Complex Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, June 2000, #2

CCN 315061 EPA-DOE. RE: Reduce Aquifer Monitoring USEPA REGION 10 to DOE Nolan Jensen FFCA/CO Manager Re: Request for Concurrence to Reduce Aquifer Monitoring Frequency at the Radioactive Waste Management Complex Beginning in Fiscal Year 2013, IDEQ letter to DOE 4/10/13, Dear Mr. Jensen/DOE,

EPA has reviewed the request to reduce aquifer monitoring at the RWMC from semi-annual to yearly sampling. EPA approves of DOE's request. Daryl Koch IDEQ/FFA/CO Manager Waste Management & Remediation Division

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How much dilution can be expected as the plume moves south, southwest or southeast? The models being used by the Department of Energy represent mixing and dilution down aquifer from waste burial. But take a look at aquifer plumes and well monitoring values and a different perspective emerges. There are *fast paths* ...

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Jul 11, 2016 - Environmental Defense Institute. Page 6 of 12 buried waste at RWMC that will remain at RWMC buried in soil is shown below in Figure 1. The contamination migration is not realistically modeled by the DOE nor is it conservatively modeled. Flooding and *fast paths* of contaminant migration are ignored. 11.

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Jul 31, 2016 - Flooding and *fast paths* of contaminant migration are ignored. 12. The ingestion doses will undoubtedly exceed the 30 to 100 mrem/yr radiation doses shown for extended periods of time. DOE has planned to bury more nuclear waste over the aquifer in the replacement for RWMC, the Remote-Handled...

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Dose.4 This was coupled with the phony argument for limited benefit to the public based on ignoring the migration of contaminants downgradient in *fast paths* and after 1000 years. 5. 6 7. Any change to the Idaho Settlement Agreement from the Department of Energy's urgent prompting increases the stranded nuclear waste...

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Apr 8, 2018 - the public based on ignoring the migration of contaminants downgradient in *fast paths* and after 1000 years 8, 9, 10. The fact is that the soil cap the DOE is planning to install over the buried waste will require maintenance forever or it will be ineffective. The doses to people drinking this water will be.

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