Determination of the SDF Inventory through 9/30/2020

December 2020

Prepared by: Savannah River Remediation LLC
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Prepared for U.S. Department of Energy Under Contract No. DE-AC09-09SR22505

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EXECUTIVE SUMMARY

This document provides the annual assessment of radionuclide inventory that has been received and disposed of (hereinafter referred to as: disposed inventory) at the Saltstone Disposal Facility (SDF). In addition, this document provides the actual inventory of radionuclides in the SDF accounting for decay of the radionuclides and the ingrowth of daughter products (hereinafter referred to as: current inventory). The inventories provided include all material sent to the SDF through the end of Fiscal Year (FY) 2020 (i.e., September 30, 2020). The current inventory in the SDF is significantly less than the disposed inventory due to the fact that the majority of the curies disposed of in the SDF are associated with Cs-137, which has an approximate 30-year half-life, along with its short-lived daughter product, Ba-137m, as well as short-lived radionuclides such as Ce-144 and Pr-144.

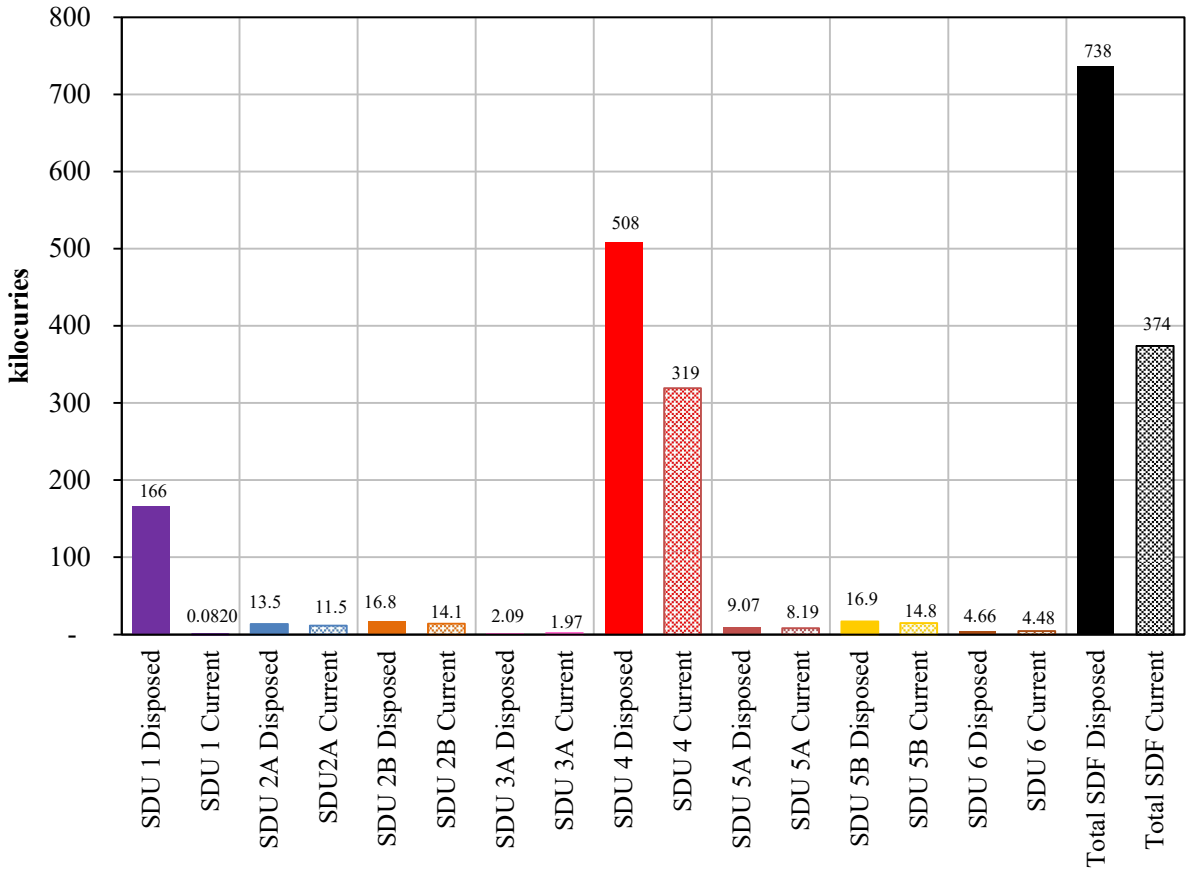
In FY2020, the Saltstone Production Facility (SPF) did not operate or process any low-level salt waste. No low-level salt waste was transferred from Tank 50 to the Saltstone Production Facility (SPF) or was emplaced in the SDF. In June 2019, the Department of Energy – Savannah River Operations Office (DOE-SR) directed the Liquid Waste contractor to cease interim salt processing and initiate tie-ins of the Liquid Waste System with the Salt Waste Processing Facility. These tie-ins precluded the transfer of low-activity waste from Tank 50 in the H-Tank Farm to the SPF. Table ES-1 summarizes the lack of salt waste treatment in FY2020. During FY2020, though, 9 kilocuries (kCi) decayed from the SDF inventory, resulting in a net decrease of approximately 9 kCi to the SDF current inventory at the end of FY2020.

Table ES-1: FY2020 Saltstone Processing Summary

	Total
FY2020 Volume of Salt Waste Disposed (kgal)	0
FY2020 Volume of Saltstone Emplaced (kgal)	0
FY2020 Curies Disposed (kCi)	0

Since initiation of operations in June 1990, the SDF has received and disposed of a combined total of 738 kCi in SDU 1 (Vault 1), SDU 2A, SDU 2B, SDU 3A, SDU 4 (Vault 4), SDU 5A, SDU 5B, and SDU 6. The current inventory in the SDF as of September 30, 2020 is 374 kCi. The difference between the disposed inventory and current inventory is due to ongoing radioactive decay, principally of Cs-137 and Ba-137m which make up 94% of the SDF current inventory and Ce-144 and Pr-144 which comprised nearly 100% of curies disposed in SDU 1. Figure ES-1 shows the disposed inventory and the current inventory in each of the SDUs as of the end of FY2020. SDUs 1 and 4 have remaining disposal space but a decision has been made to discontinue future saltstone emplacement operations to these units. [SRR-LWP-2009-00001] In FY2014, SDUs 2A and 2B were filled to their operational capacity; no further disposal to these units is anticipated. In FY2016 and FY2017, SDU 5A and SDU 5B, respectively, were filled to their operational capacity; no further disposal to these units is anticipated. At the beginning of FY2020, all of SDU Cell 3B and the remaining operational volume of SDU Cell 3A and SDU 6 were available to emplace saltstone. No saltstone grout was emplaced in SDU Cell 3A, Cell 3B, or SDU 6 in FY2020.

Figure ES-1: SDF Disposed Inventory and Current Inventory per SDU through FY2020



Note: SDU 4 inventory includes the inventory of 10,032 United States Naval Fuel Material Facility 55-gallon drums emplaced in Cell A. Additionally, radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246 which were previously reported are included as part of the SDU 1 and 4 total inventories here as they were input into the SDF-WIDE model, but totals shown in Tables 2-1 and 2-5 no longer include these radionuclides since they are no longer measured or reported after being screened out as modeled SDF Inventory Radionuclides in SRR-CWDA-2009-00017.

In March 2007, the SDF began emplacing saltstone produced with decontaminated salt solution (DSS), a type of low-level salt waste associated with Interim Salt Processing (ISP). Interim Salt Processing includes salt treatment utilizing the Deliquification, Dissolution, and Adjustment (DDA) process and Actinide Removal Process (ARP) / Modular Caustic Side Solvent Extraction Unit (MCU) processes. Through September 30, 2020, 476 kCi associated with ISP have been disposed of in the SDF. As shown in Table ES-2, the current inventory in the SDF as of September 30, 2020 associated with ISP is 374 kCi. At the end of FY2020 there was a difference of less than three hundred Ci between the current inventory in the SDF since initiation of operations in 1990 (374.3 kCi), including ISP operations, and the current inventory in the SDF associated with ISP alone (374.0 kCi).

Table ES-2: SDF Inventory Summary FY1990 through FY2020

	All Salt Processing[a] FY1990-FY2020 (kCi)		Interim Salt Processing[a] FY2007-FY2020 (kCi)	
	Disposed	Current	Disposed	Current
SDF Total	738	374	476	374
SDU 1	166	0.0820	0	0
SDU 2A	13.5	11.5	13.5	11.5
SDU 2B	16.8	14.1	16.8	14.1
SDU 3A	2.09	1.97	2.09	1.97
SDU 4[b]	508	319	413	319
SDU 5A	9.07	8.19	9.07	8.19
SDU 5B	16.9	14.8	16.9	14.8
SDU 6	4.66	4.48	4.66	4.48

[a] Includes Interim Salt Processing.

[b] SDU 4 inventory includes the inventory of 10,032 United States Naval Fuel Material Facility 55-gallon drums emplaced in Cell A. [OPS-DTZ-90-0027]

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ACRONYMS

ARP	Actinide Removal Process
DDA	Deliquification, Dissolution, and Adjustment
DOE	U.S. Department of Energy
DOE-SR	U.S. Department of Energy - Savannah River Operations Office
DSS	Decontaminated Salt Solution
ETF	Effluent Treatment Facility
FY	Fiscal Year
HLW	High Level Waste
kCi	kilocuries
kgal	kilogallons
ISP	Interim Salt Processing
ITP	In-Tank Precipitation
MCU	Modular Caustic Side Solvent Extraction Unit
MST	Monosodium Titanate
SCDHEC	South Carolina Department of Health and Environmental Control
SDF	Saltstone Disposal Facility
SDF-WIDE	Saltstone Disposal Facility Waste Inventory Disposed Estimator
SDU	Saltstone Disposal Unit
SPF	Saltstone Production Facility
TCCR	Tank Closure Cesium Removal

1.0 METHODOLOGY

The Saltstone Disposal Facility (SDF) inventory presented in this document was determined using the Saltstone Disposal Facility Waste Inventory Disposed Estimator (SDF-WIDE) model. The SDF-WIDE model uses GoldSim software to perform inventory calculations and to track the volume and curies disposed of (with and without decay and ingrowth) within each Saltstone Disposal Unit (SDU). The *Saltstone Disposal Facility Waste Inventory Disposed Estimator Model Report* provides a detailed description of the approach and methodology used in the SDF-WIDE model. [SRR-CWDA-2015-00003]

The inputs for the SDF-WIDE model are the Tank 50 sample concentrations and the Tank 50 transfer volumes from Tank 50 to the Saltstone Production Facility (SPF). Since no processing occurred during Fiscal Year (FY) 2020, no additional crosswalks of the source information were used to develop the inventory (i.e., disposed of and current). All historical SDF inputs used to develop the inventory (i.e., disposed of and current) since the beginning of SDF processing (i.e., 1990) through FY2014 can be found in the SDF-WIDE model report (SRR-CWDA-2015-00003) and subsequent inventory determinations (SRR-CWDA-2015-00149, SRR-CWDA-2016-00111, SRR-CWDA-2017-00079, SRR-CWDA-2018-00041, SRR-CWDA-2018-00072, SRR-CWDA-2019-00110). All SDF inventory presented in this document was determined using SDF-WIDE model Version 1.11.

2.0 SDF INVENTORY

2.1 SDF Processing History

The SDF was originally permitted to receive treated salt solution from the In-Tank Precipitation (ITP) process. The permits were subsequently modified to provide for the treatment of residues from the Effluent Treatment Facility (ETF). The ITP process was designed to remove targeted radioisotopes from salt solution originating from High Level Waste (HLW) tanks prior to disposal at the SDF. The SPF began receiving radioactive waste for treatment in June 1990 with transfers from Tank 50; the resultant saltstone was emplaced in SDU 1. Saltstone operations continued through August 1998 with emplacement in SDU 1 and SDU 4 until the facility was put in “lay up” mode because of difficulties with the ITP process. [WSRC-RP-2008-00390] In addition to emplaced saltstone, SDU 4 contains 10,032 United States Naval Fuel Material Facility 55-gallon drums emplaced in Cell A in 1990. [OPS-DTZ-90-0027]

In early 2002, efforts began to restart saltstone production. In 2007, U.S. Department of Energy (DOE) received concurrence from the South Carolina Department of Health and Environmental Control (SCDHEC) to treat and dispose of low-activity salt waste. This treatment included processing lower activity salt waste by Deliquification, Dissolution, and Adjustment (DDA) and processing slightly higher activity waste using an Actinide Removal Process (ARP) and a Modular Caustic Side Solvent Extraction Unit (MCU). The treated salt solution resulting from these processes is referred to as decontaminated salt solution (DSS). The two treatment methods, DDA and ARP/MCU, are collectively referred to as Interim Salt Processing (ISP). [WSRC-RP-2008-00390, DOE-WD-2005-001]

In March 2007, the first DDA material was transferred into Tank 50 and subsequently processed at the SPF and disposed of in SDU 4. [SPD-07-153] In April 2008, Tank 50 began receiving DSS from ARP/MCU, in addition to receipts of DDA material. Tank 50 continued to receive material

from both DDA and ARP/MCU until September 2009 when the last DDA transfer into Tank 50 was completed. [LWO-PIT-2007-00083, SRR-LWP-2010-00007] Treatment of salt waste through ARP/MCU continued through the end of FY2019. In May 2011, DOE formally declared that the DDA processing was complete at SPF. [OCC-11-0070]

As a part of ISP, the ARP was designed to have the capability to perform a single monosodium titanate (MST) strike. When mixed with liquid salt waste, MST sorbs to strontium and soluble actinides which allows them to be removed from the liquid waste stream via crossflow filtration. Experience from ARP operations showed that the crossflow filter often plugged with solids, limiting flow rates and requiring regular filter cleaning. The degraded filter throughput rate limited salt waste processing rates and also resulted in a higher volume and activity of radioactive material being disposed of in the SDF. In 2014, ARP/MCU operations began evaluating discontinuing MST strikes in the ARP to increase effectiveness of ARP/MCU. As filter cleaning activities contributed significantly more curies than that of the soluble strontium and actinides removed through MST strikes to be disposed in the SDF, it was expected and confirmed that discontinuing MST strikes as a part of ARP treatment would result not only in an increase in salt processing throughput but would have the added benefit of decreasing the overall curries disposed of in the SDF throughout the life of ISP. The quantity of soluble Sr-90 and soluble actinides in salt batches following MST suspension is anticipated to remain relatively low and the addition of these curies to the SDF inventory will be insignificant from a risk perspective. In January 2016, MST strikes were discontinued in ARP/MCU. [SRR-CWDA-2015-00033, SRR-CWDA-2017-00030]

In 2019, SDF began receiving and disposing of material as part of the Tank Closure Cesium Removal (TCCR) process. TCCR is a demonstration project designed to support tank farm closure by removing cesium and suspended solids via filtering from salt waste. TCCR uses filters, ion exchange columns, and a specially engineered resin to remove cesium. Currently, waste from Tank 10 passes through the TCCR process capturing cesium within the resin. The decontaminated salt solution (DSS) from the TCCR process is transferred to Tank 11 and then transferred to SPF via Tank 50. In March and April of 2019, 158,000 gallons of DSS was transferred from Tank 11 to Tank 50 containing 585 Ci of Cs-137/Ba-137m. [G-CLC-H-00138] These 585 Ci were disposed of as part of the FY2019 SDF inventory. No DSS was disposed of during FY2020.

This document provides the current inventory of the SDF through FY2020. The current inventory takes into account decay and ingrowth of daughter products. This document also provides the overall disposed inventory at the SDF through FY2020 and the disposed inventory specifically associated with ISP during the period from March 2007 through FY2020.

2.2 Current Inventory

The current inventory at the SDF is the inventory for all waste disposed from June 1990 through FY2020 taking into account radioactive decay and ingrowth. There was no material added to SDU 1, SDU 2A, SDU 2B, SDU 3A, SDU 4, SDU 5A, SDU 5B, or SDU 6 in FY2020, therefore, the changes to those inventories since September 30, 2019 were only due to decay and ingrowth. There have been no waste receipts into SDU 3B as of FY2020. SDU 1 last received waste in September 1996, SDU 2A last received waste in June 2014, SDU 2B last received waste in July 2014, SDU 3A last received waste in May 2018, SDU 4 last received waste in November 2011, SDU 5A last received waste in August 2016, SDU 5B last received waste in February 2017, and SDU 6 last received waste in May 2019. There are no plans to receive any additional waste in SDU 1, SDU 2A, SDU 2B, SDU 4, SDU 5A and SDU 5B. [SRR-LWP-2009-00001, X-CLC-Z-

00070, X-CLC-Z-00078, X-CLC-Z-00081, X-CLC-Z-00085, Tk 50 SS Tracking Log.xlsm] The SDF inputs from facility startup through FY2014 are provided in *Saltstone Disposal Facility Waste Inventory Disposed Estimator Model Report*, SRR-CWDA-2015-00003. FY2015, FY2016, FY2017, FY2018, and FY2019 inputs are provided in annual inventory determination reports, SRR-CWDA-2015-00149, SRR-CWDA-2016-00111, SRR-CWDA-2017-00079, SRR-CWDA-2018-00072, and SRR-CWDA-2019-00110, respectively, as well as in *Determination of Inventory for FY2019 Performance Assessment Modeling*, SRR-CWDA-2018-00041.

Figure 2-1 shows the current inventory at the SDF from FY1990 through FY2020. The current inventory (which includes decay and ingrowth) for the SDF through FY2020 is 374 kCi. The current inventory for each SDU on September 30, 2020 is presented in Figure 2-2.

The current inventory through FY2020 for each radionuclide within each SDU is provided in Tables 2-1 through 2-8. As shown in these tables, the largest contributors to the current inventory in SDUs 2A, 2B, 3A, 4, 5A, 5B, and 6 are Cs-137 and Ba-137m. Cs-137 and Ba-137m make up 98% of the current inventory in SDU 2A and SDU 2B, 97% of the current inventory in SDU 4, 97% of the current inventory in SDU 5B, 91% of the current inventory in SDU 3A, 89% of the current inventory in SDU 6, and 85% of the current inventory in SDU 5A. Tc-99 and H-3 are the largest contributors to the current inventory in SDU 1, with 60% of the inventory being Tc-99 and 14% of the inventory being H-3.

Figure 2-1: SDF Current Inventory through FY2020

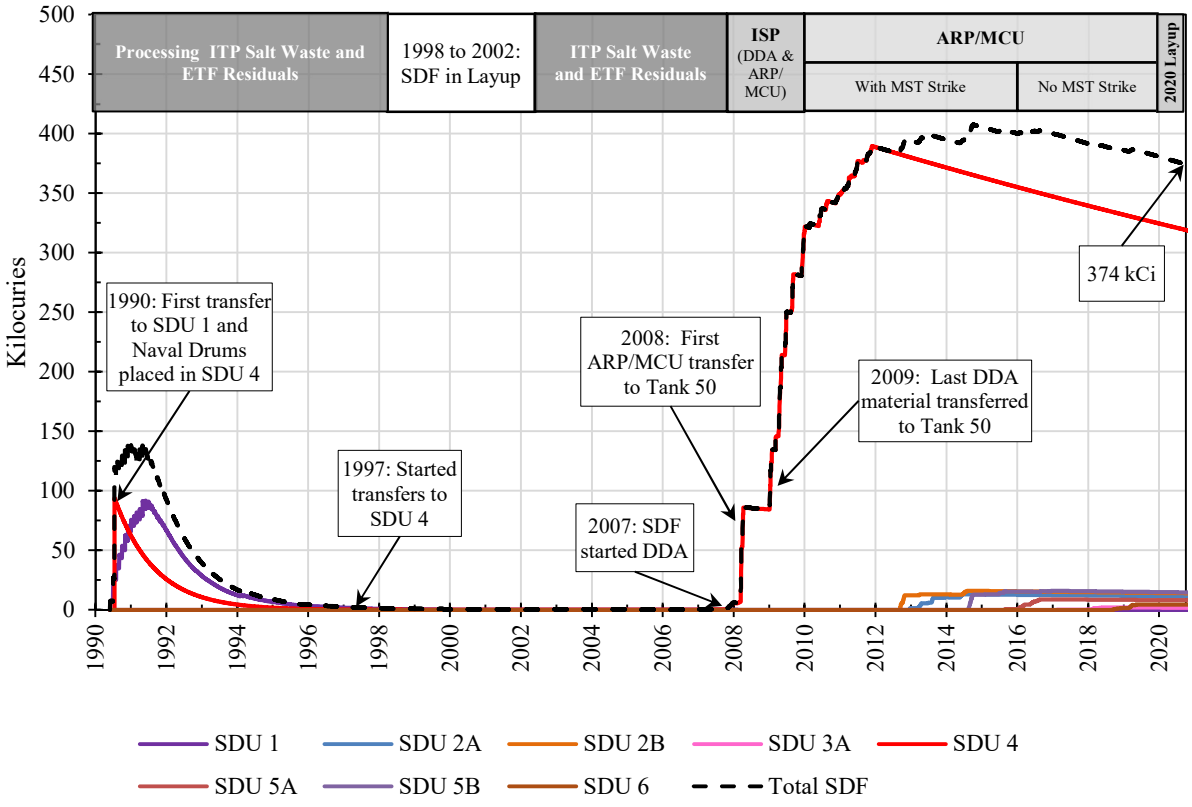
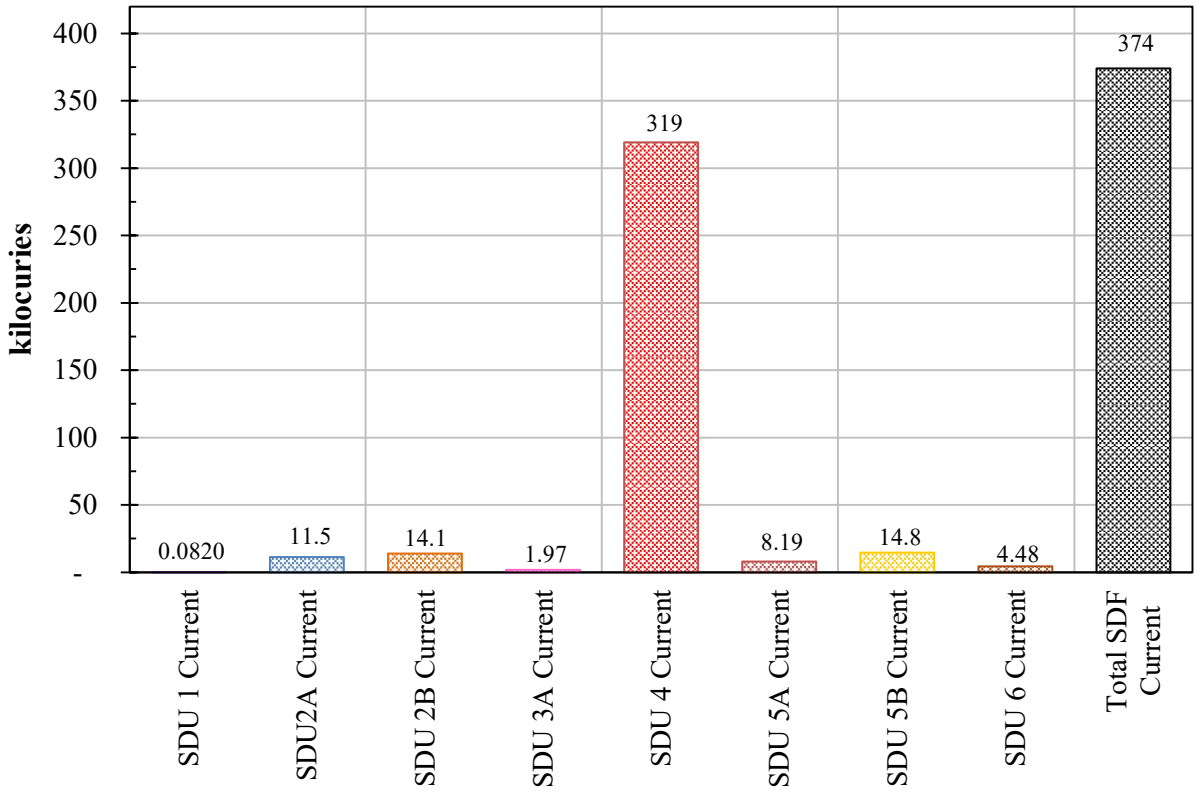


Figure 2-2: Current Inventory of SDUs on September 30, 2020



Note: Radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246 which were previously reported are included as part of the SDU 1 and 4 total inventories here as they were input into the SDF-WIDE model, but totals shown in Tables 2-1 and 2-5 no longer include these radionuclides since they are no longer measured or reported after being screened out as modeled SDF Inventory Radionuclides in SRR-CWDA-2009-00017.

Table 2-1: SDU 1 Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.15E+01	Eu-155	2.46E-04
C-14	1.31E+00	Pt-193	1.58E+00
Na-22	6.81E-01	Ra-226	5.54E-07
Al-26	2.62E-01	Ra-228	7.68E-06
Cl-36	9.75E-08	Ac-227	1.79E-06
K-40	9.75E-08	Th-229	4.24E-04
Co-60	2.96E-04	Th-230	5.00E-05
Ni-59	2.30E-03	Th-232	7.68E-06
Ni-63	1.17E-01	Pa-231	3.21E-06
Se-79	3.44E-01	U-232	6.35E-04
Y-90	1.44E-02	U-233	7.76E-02
Sr-90	1.44E-02	U-234	9.93E-02
Zr-93	7.68E-01	U-235	2.51E-03
Nb-93m	7.55E-01	U-236	6.49E-03
Nb-94	2.03E-03	U-238	1.07E-02
Tc-99	4.93E+01	Np-237	3.94E-03
Ru-106	5.80E-08	Pu-238	7.02E-03
Rh-106	5.81E-08	Pu-239	1.43E-02
Pd-107	8.38E-03	Pu-240	1.35E-02
Sn-126	1.22E+00	Pu-241	1.78E-02
Sb-125	1.09E-02	Pu-242	1.57E-03
Sb-126	1.71E-01	Pu-244	1.01E-05
Sb-126m	1.22E+00	Am-241	2.04E-03
Te-125m	2.67E-03	Am-242m	6.72E-05
I-129	2.01E-01	Am-243	1.42E-03
Cs-134	3.11E-04	Cm-242	7.30E-06
Cs-135	4.95E-02	Cm-243	4.32E-04
Cs-137	5.92E+00	Cm-244	2.70E-03
Ba-137m	5.59E+00	Cm-245	2.72E-04
Pr-144	5.12E-07	Cm-247	1.59E-13
Ce-144	5.17E-07	Cm-248	1.66E-13
Pm-147	1.31E-03	Bk-249	1.58E-25
Sm-151	5.41E-03	Cf-249	8.74E-13
Eu-152	1.33E-03	Cf-251	3.08E-14
Eu-154	4.18E-04	Cf-252	2.18E-17
		Total	**8.20E+01**[a]

[a] Radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246 which were previously reported as part of the SDU 1 total inventory and are included in the total inventory in other sections of this document equaling (8.31E+01 Ci); are no longer measured or reported as they were screened out as modeled SDF Inventory Radionuclides in SRR-CWDA-2009-00017 and are not included in this total. .

Table 2-2: SDU 2 Cell A Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.98E+00	Eu-155	2.27E-03
C-14	2.41E+00	Pt-193	1.51E+00
Na-22	4.66E-01	Ra-226	2.58E-06
Al-26	8.98E-04	Ra-228	1.26E-05
Cl-36	1.06E-04	Ac-227	7.11E-07
K-40	1.06E-04	Th-229	2.94E-03
Co-60	6.32E-04	Th-230	8.08E-04
Ni-59	9.16E-04	Th-232	1.26E-05
Ni-63	4.36E-02	Pa-231	1.27E-06
Se-79	1.34E-01	U-232	1.33E-02
Y-90	1.57E+01	U-233	9.51E-01
Sr-90	1.56E+01	U-234	6.16E-01
Zr-93	2.64E-01	U-235	9.93E-04
Nb-93m	2.76E-01	U-236	6.37E-03
Nb-94	1.89E-03	U-238	2.24E-02
Tc-99	1.14E+02	Np-237	1.60E-01
Ru-106	1.04E-04	Pu-238	5.59E+00
Rh-106	1.04E-04	Pu-239	5.28E-01
Pd-107	6.03E-03	Pu-240	5.28E-01
Sn-126	7.62E-01	Pu-241	1.45E+00
Sb-125	4.50E-02	Pu-242	3.76E-01
Sb-126	1.07E-01	Pu-244	1.74E-03
Sb-126m	7.62E-01	Am-241	6.66E-02
Te-125m	1.10E-02	Am-242m	9.84E-03
I-129	7.31E-02	Am-243	4.21E-03
Cs-134	4.17E-02	Cm-242	2.75E-04
Cs-135	3.36E-02	Cm-243	5.03E-04
Cs-137	5.80E+03	Cm-244	1.76E-01
Ba-137m	5.47E+03	Cm-245	1.45E-02
Pr-144	3.03E-07	Cm-247	1.67E-02
Ce-144	3.06E-07	Cm-248	1.20E-13
Pm-147	3.48E-02	Bk-249	9.54E-26
Sm-151	1.63E-01	Cf-249	1.77E-02
Eu-152	2.24E-04	Cf-251	1.34E-02
Eu-154	6.56E-03	Cf-252	1.49E-17
		Total	**1.15E+04**

Table 2-3: SDU 2 Cell B Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.68E+00	Eu-155	2.27E-03
C-14	2.44E+00	Pt-193	1.51E+00
Na-22	4.69E-01	Ra-226	1.49E-06
Al-26	8.55E-04	Ra-228	1.92E-05
Cl-36	1.30E-04	Ac-227	9.12E-07
K-40	1.30E-04	Th-229	6.37E-03
Co-60	7.09E-04	Th-230	4.28E-04
Ni-59	7.32E-04	Th-232	1.92E-05
Ni-63	3.47E-02	Pa-231	1.63E-06
Se-79	1.23E-01	U-232	1.30E-02
Y-90	1.92E+01	U-233	1.32E+00
Sr-90	1.92E+01	U-234	8.54E-01
Zr-93	3.83E-01	U-235	1.27E-03
Nb-93m	4.18E-01	U-236	8.85E-03
Nb-94	1.63E-03	U-238	2.65E-02
Tc-99	1.37E+02	Np-237	9.61E-02
Ru-106	7.61E-05	Pu-238	5.31E+00
Rh-106	7.61E-05	Pu-239	5.19E-01
Pd-107	6.06E-03	Pu-240	5.19E-01
Sn-126	6.83E-01	Pu-241	1.37E+00
Sb-125	1.42E-01	Pu-242	5.21E-01
Sb-126	9.56E-02	Pu-244	2.42E-03
Sb-126m	6.83E-01	Am-241	8.04E-02
Te-125m	3.48E-02	Am-242m	6.26E-03
I-129	6.83E-02	Am-243	4.89E-03
Cs-134	3.30E-02	Cm-242	1.75E-04
Cs-135	3.38E-02	Cm-243	5.00E-04
Cs-137	7.14E+03	Cm-244	2.00E-01
Ba-137m	6.74E+03	Cm-245	2.22E-02
Pr-144	3.06E-07	Cm-247	1.41E-02
Ce-144	3.09E-07	Cm-248	1.20E-13
Pm-147	2.70E-02	Bk-249	9.64E-26
Sm-151	1.43E-01	Cf-249	1.46E-02
Eu-152	2.26E-04	Cf-251	1.08E-02
Eu-154	1.18E-02	Cf-252	1.50E-17
		Total	**1.41E+04**

Table 2-4: SDU 3 Cell A Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.42E+00	Eu-155	2.72E-03
C-14	7.02E-01	Pt-193	3.62E-01
Na-22	1.05E-01	Ra-226	5.95E-08
Al-26	1.32E-04	Ra-228	2.21E-06
Cl-36	2.50E-04	Ac-227	2.98E-05
K-40	2.50E-04	Th-229	1.52E-04
Co-60	3.44E-04	Th-230	2.62E-05
Ni-59	3.04E-04	Th-232	2.21E-06
Ni-63	1.49E-02	Pa-231	3.33E-07
Se-79	4.18E-02	U-232	3.34E-03
Y-90	3.71E+01	U-233	1.95E-01
Sr-90	3.71E+01	U-234	1.26E-01
Zr-93	6.08E-02	U-235	2.60E-04
Nb-93m	1.18E-01	U-236	1.39E-03
Nb-94	4.45E-04	U-238	4.75E-03
Tc-99	5.70E+01	Np-237	1.42E-02
Ru-106	8.85E-04	Pu-238	3.13E+01
Rh-106	8.86E-04	Pu-239	7.86E-01
Pd-107	1.36E-03	Pu-240	7.86E-01
Sn-126	5.67E-01	Pu-241	9.62E+00
Sb-125	5.82E-03	Pu-242	7.69E-02
Sb-126	7.94E-02	Pu-244	3.57E-04
Sb-126m	5.67E-01	Am-241	5.97E-02
Te-125m	1.43E-03	Am-242m	5.34E-05
I-129	4.36E-02	Am-243	3.77E-04
Cs-134	2.79E-02	Cm-242	1.20E-06
Cs-135	7.58E-03	Cm-243	1.26E-04
Cs-137	9.21E+02	Cm-244	8.47E-03
Ba-137m	8.69E+02	Cm-245	2.05E-03
Pr-144	6.90E-08	Cm-247	8.38E-04
Ce-144	6.97E-08	Cm-248	2.70E-14
Pm-147	2.47E-02	Bk-249	2.16E-26
Sm-151	3.92E-02	Cf-249	8.77E-04
Eu-152	5.06E-05	Cf-251	6.09E-04
Eu-154	1.35E-03	Cf-252	3.37E-18
		Total	**1.97E+03**

Table 2-5: SDU 4 Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	3.06E+01	Eu-155	4.39E-01
C-14	6.51E+00	Pt-193	8.56E+00
Na-22	2.21E+00	Ra-226	4.33E-05
Al-26	9.75E-01	Ra-228	2.10E-04
Cl-36	1.49E-02	Ac-227	6.70E-05
K-40	1.49E-02	Th-229	3.63E+00
Co-60	4.84E-02	Th-230	4.98E-03
Ni-59	7.89E-02	Th-232	2.10E-04
Ni-63	3.07E+00	Pa-231	1.20E-04
Se-79	9.75E+00	U-232	1.15E-01
Y-90	2.22E+03	U-233	8.86E+00
Sr-90	2.22E+03	U-234	8.97E+00
Zr-93	8.15E+00	U-235	9.37E-02
Nb-93m	1.08E+03	U-236	8.34E-02
Nb-94	8.93E-02	U-238	7.93E-02
Tc-99	6.34E+02	Np-237	5.76E-01
Ru-106	4.30E-04	Pu-238	3.05E+02
Rh-106	4.30E-04	Pu-239	5.86E+01
Pd-107	3.75E-02	Pu-240	7.28E+01
Sn-126	2.22E+00	Pu-241	7.83E+01
Sb-125	1.31E+01	Pu-242	4.12E+00
Sb-126	3.11E-01	Pu-244	1.68E-02
Sb-126m	2.22E+00	Am-241	2.08E+01
Te-125m	3.22E+00	Am-242m	1.88E-02
I-129	2.77E-01	Am-243	5.18E-01
Cs-134	5.42E-01	Cm-242	8.48E-04
Cs-135	1.73E+00	Cm-243	7.77E-03
Cs-137	1.59E+05	Cm-244	2.90E+01
Ba-137m	1.50E+05	Cm-245	7.78E-01
Pr-144	2.20E-05	Cm-247	1.06E-01
Ce-144	2.22E-05	Cm-248	7.43E-13
Pm-147	1.70E+00	Bk-249	1.67E-24
Sm-151	1.93E+01	Cf-249	2.76E-01
Eu-152	6.36E-02	Cf-251	9.28E-02
Eu-154	2.49E+00	Cf-252	1.10E-16
		Total	**3.19E+05[a]**

Note: SDU 4 inventory includes the inventory of 10,032 United States Naval Fuel Material Facility 55-gallon drums emplaced in Cell A. [OPS-DTZ-90-0027]

[a] Radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246, which were previously reported as part of the SDU 4 total inventory and are included in the total inventory in other sections of this document (3.26E+05 Ci), are no longer measured or reported as they were screened out as modeled SDF Inventory Radionuclides in SRR-CWDA-2009-00017 and are not included in this total.

Table 2-6: SDU 5 Cell A Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	4.84E+00	Eu-155	1.08E-02
C-14	3.18E+00	Pt-193	1.68E+00
Na-22	4.98E-01	Ra-226	5.03E-07
Al-26	1.02E-03	Ra-228	1.35E-05
Cl-36	3.10E-03	Ac-227	4.00E-05
K-40	3.10E-03	Th-229	6.35E-04
Co-60	1.67E-02	Th-230	2.00E-04
Ni-59	1.26E-03	Th-232	1.35E-05
Ni-63	6.09E-02	Pa-231	1.96E-06
Se-79	2.72E-01	U-232	1.40E-02
Y-90	4.58E+02	U-233	1.17E+00
Sr-90	4.58E+02	U-234	7.56E-01
Zr-93	3.05E-01	U-235	1.53E-03
Nb-93m	5.13E-01	U-236	7.82E-03
Nb-94	2.66E-03	U-238	3.28E-02
Tc-99	1.75E+02	Np-237	8.51E-02
Ru-106	1.23E-03	Pu-238	7.42E+01
Rh-106	1.23E-03	Pu-239	1.86E+00
Pd-107	6.46E-03	Pu-240	1.85E+00
Sn-126	1.65E+00	Pu-241	2.30E+01
Sb-125	2.05E-02	Pu-242	4.61E-01
Sb-126	2.31E-01	Pu-244	2.14E-03
Sb-126m	1.65E+00	Am-241	2.02E-01
Te-125m	5.01E-03	Am-242m	9.94E-04
I-129	1.39E-01	Am-243	3.91E-03
Cs-134	1.06E-01	Cm-242	1.63E-05
Cs-135	3.60E-02	Cm-243	5.76E-04
Cs-137	3.59E+03	Cm-244	8.71E-02
Ba-137m	3.39E+03	Cm-245	1.50E-02
Pr-144	3.21E-07	Cm-247	2.13E-02
Ce-144	3.24E-07	Cm-248	1.28E-13
Pm-147	8.16E-02	Bk-249	1.01E-25
Sm-151	2.52E-01	Cf-249	2.22E-02
Eu-152	2.40E-04	Cf-251	1.68E-02
Eu-154	3.40E-03	Cf-252	1.59E-17
		Total	**8.19E+03**

Table 2-7: SDU 5 Cell B Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	2.97E+00	Eu-155	4.97E-03
C-14	3.78E+00	Pt-193	1.65E+00
Na-22	5.01E-01	Ra-226	5.23E-07
Al-26	8.59E-04	Ra-228	2.26E-05
Cl-36	7.71E-04	Ac-227	6.62E-05
K-40	1.72E-03	Th-229	5.92E-04
Co-60	7.69E-04	Th-230	1.85E-04
Ni-59	5.15E-04	Th-232	2.26E-05
Ni-63	2.48E-02	Pa-231	1.62E-06
Se-79	1.68E-01	U-232	1.92E-02
Y-90	1.14E+02	U-233	1.07E+00
Sr-90	1.14E+02	U-234	6.87E-01
Zr-93	2.86E-01	U-235	1.27E-03
Nb-93m	3.11E-01	U-236	7.18E-03
Nb-94	2.06E-03	U-238	2.85E-02
Tc-99	1.20E+02	Np-237	7.76E-02
Ru-106	5.66E-04	Pu-238	2.56E+01
Rh-106	5.66E-04	Pu-239	7.39E-01
Pd-107	6.42E-03	Pu-240	7.39E-01
Sn-126	9.47E-01	Pu-241	7.62E+00
Sb-125	1.47E-02	Pu-242	4.21E-01
Sb-126	1.33E-01	Pu-244	1.95E-03
Sb-126m	9.47E-01	Am-241	7.79E-02
Te-125m	3.59E-03	Am-242m	8.20E-04
I-129	8.68E-02	Am-243	9.21E-03
Cs-134	9.68E-02	Cm-242	1.54E-05
Cs-135	3.58E-02	Cm-243	5.59E-04
Cs-137	7.42E+03	Cm-244	9.88E-02
Ba-137m	7.00E+03	Cm-245	1.31E-02
Pr-144	3.33E-07	Cm-247	1.77E-02
Ce-144	3.36E-07	Cm-248	1.27E-13
Pm-147	6.47E-02	Bk-249	1.04E-25
Sm-151	2.08E-01	Cf-249	1.82E-02
Eu-152	2.39E-04	Cf-251	1.51E-02
Eu-154	3.54E-03	Cf-252	1.60E-17
		Total	**1.48E+04**

Table 2-8: SDU 6 Current Inventory on September 30, 2020

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	3.31E+00	Eu-155	6.14E-04
C-14	1.29E+00	Pt-193	9.13E-01
Na-22	2.61E-01	Ra-226	2.02E-07
Al-26	4.80E-04	Ra-228	8.44E-06
Cl-36	8.09E-04	Ac-227	4.31E-07
K-40	2.27E-03	Th-229	2.29E-03
Co-60	4.21E-04	Th-230	1.80E-04
Ni-59	6.51E-04	Th-232	8.45E-06
Ni-63	3.22E-02	Pa-231	7.70E-07
Se-79	7.76E-02	U-232	6.36E-03
Y-90	1.20E+02	U-233	5.49E-01
Sr-90	1.20E+02	U-234	3.62E-01
Zr-93	2.49E-01	U-235	6.01E-04
Nb-93m	3.05E-01	U-236	3.83E-03
Nb-94	8.52E-04	U-238	1.00E-02
Tc-99	1.35E+02	Np-237	4.00E-02
Ru-106	1.96E-03	Pu-238	7.41E+01
Rh-106	1.96E-03	Pu-239	1.92E+00
Pd-107	3.38E-03	Pu-240	1.92E+00
Sn-126	1.34E+00	Pu-241	2.24E+01
Sb-125	1.58E-02	Pu-242	2.17E-01
Sb-126	1.87E-01	Pu-244	1.01E-03
Sb-126m	1.34E+00	Am-241	7.42E-02
Te-125m	3.88E-03	Am-242m	7.39E-05
I-129	8.96E-02	Am-243	7.38E-04
Cs-134	1.13E-01	Cm-242	4.64E-06
Cs-135	1.15E-02	Cm-243	3.22E-04
Cs-137	2.06E+03	Cm-244	3.46E-02
Ba-137m	1.94E+03	Cm-245	1.93E-03
Pr-144	1.68E-07	Cm-247	6.43E-14
Ce-144	1.70E-07	Cm-248	6.71E-14
Pm-147	7.37E-02	Bk-249	5.27E-26
Sm-151	1.10E-01	Cf-249	3.71E-13
Eu-152	1.26E-04	Cf-251	1.27E-14
Eu-154	1.39E-03	Cf-252	8.33E-18
		Total	**4.48E+03**

2.3 Disposed Inventory

The disposed inventory at the SDF from startup in FY1990 through FY2020 is presented in Figures 2-3 and 2-4. The disposed inventory does not take into account decay or ingrowth and represents the number of curies transferred into the SDF. The total SDF disposed inventory through FY2020 is 738 kCi. The majority of this inventory was emplaced in SDU 4.

Figure 2-3: SDF Disposed Inventory through FY2020

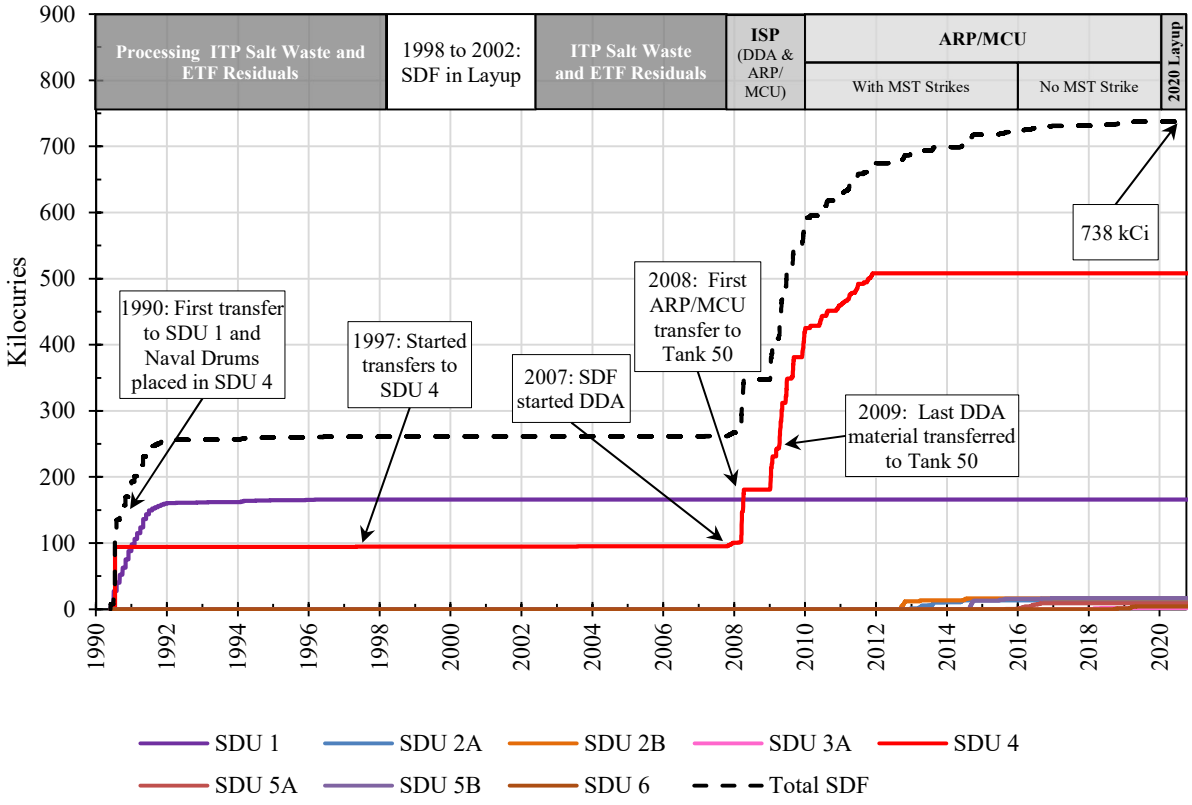
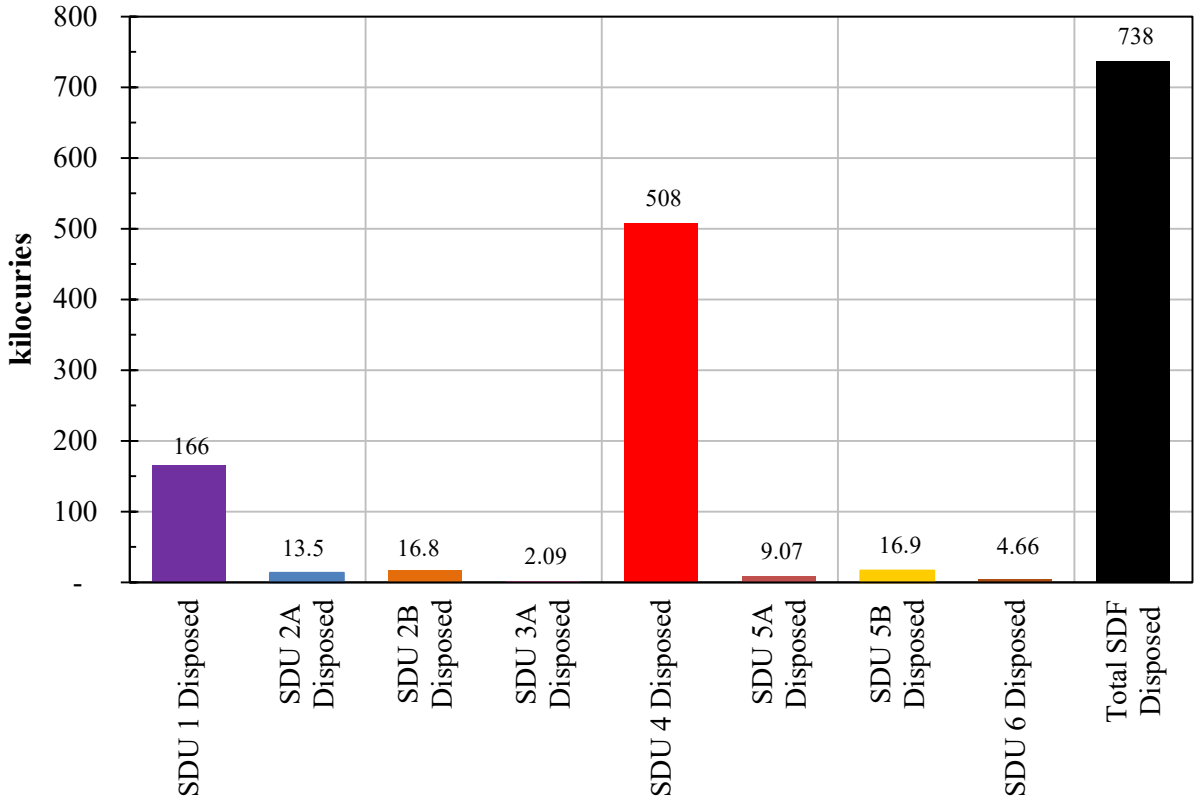


Figure 2-4: Disposed Inventory of SDUs through FY2020



Note: Radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246 are included as part of the SDU 1 and 4 total disposed inventory here as they were previously reported and input into the SDF-WIDE model. Additionally, SDU 4 inventory includes the inventory of 10,032 United States Naval Fuel Material Facility 55-gallon drums emplaced in Cell A. [OPS-DTZ-90-0027]

2.3.1 FY2020 Saltstone Processing

In FY2020, the Saltstone Production Facility did not operate or process any low-level salt waste. The entire SDF inventory underwent a total of 9 kCi of decay during FY2020, resulting in a net decrease of approximately 9 kCi to the SDF current inventory at the end of FY2020.

Table 2-9 presents a summary of the processing done in FY2020.

Table 2-9: FY2020 Saltstone Processing Summary

	Total
FY2020 Volume of Salt Waste Disposed (kgal)	0
FY2020 Volume of Saltstone Emplaced (kgal)	0
FY2020 Curies Disposed (kCi)	0

2.3.2 Inventory Disposed During Interim Salt Processing

In March 2007, the SDF began emplacing saltstone containing DSS associated with ISP. Figure 2-5 shows the SDF inventory disposed of during the ISP period. SDU 1 is not included because processing to SDU 1 ended in 1996, prior to the start of DDA. As shown in the figure, the total curies disposed from March 2007 through FY2020 is 476 kCi.

Note that although SDU 4 is the dominant disposal unit with respect to the total number of curies disposed since 2007 (see Figure 2-3), the other SDUs (SDU 2A, SDU 2B, SDU 3A, SDU 5A, SDU 5B, and SDU 6) have each received a considerable volume of DSS. SDUs 2A, 2B, 5A, and 5B are considered completely filled. Figure 2-6 depicts the total number of gallons of salt waste disposed at the SDF from March 2007 through FY2020. As shown in the figure, the total volume of salt waste disposed from March 2007 through FY2020 is 13,600 kgal.

Figure 2-5: SDF Disposed Curies through FY2020 – Beginning with Start of Interim Salt Processing (DDA & ARP/MCU)

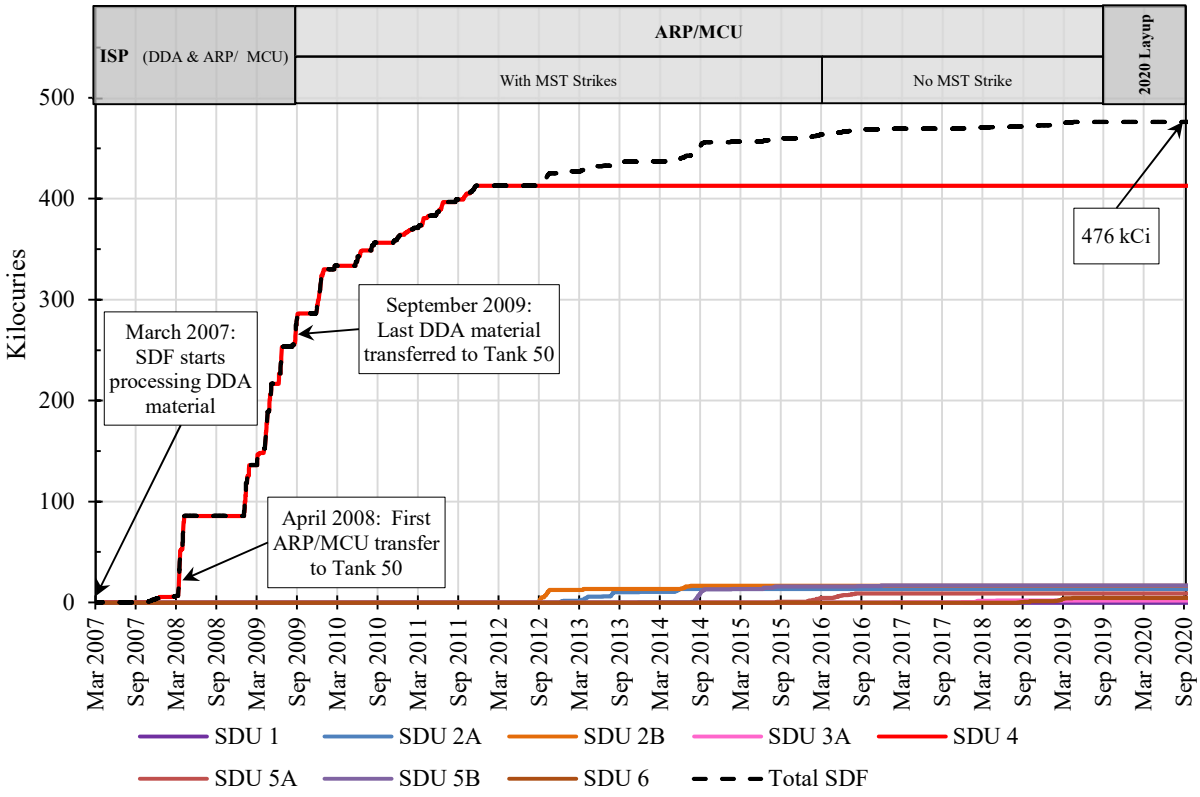
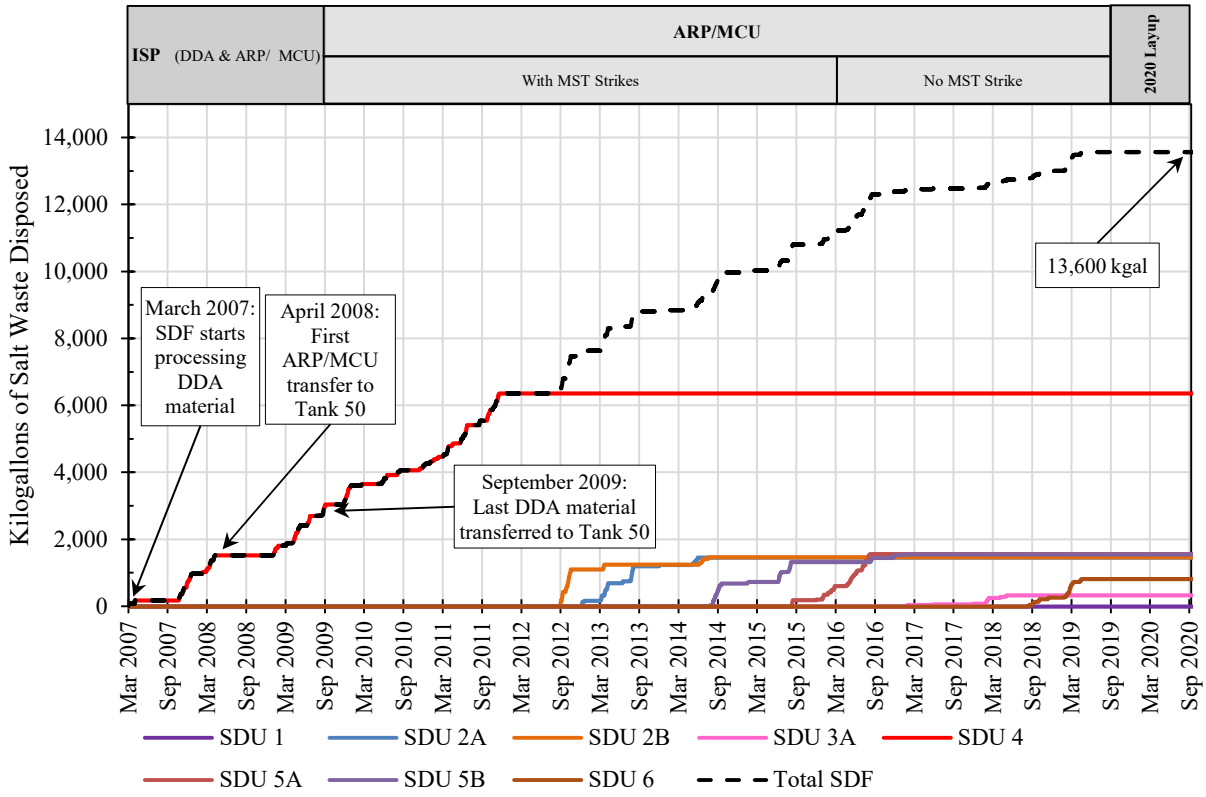


Figure 2-6: Salt Waste Disposed through FY2020 – Beginning with Start of Interim Salt Processing (DDA & ARP/MCU)



2.4 Comparison of Current and Disposed Inventory

Figures 2-1 and 2-3 present the SDF current inventory and disposed inventory, respectively, from FY1990 through FY2020. The data in Figures 2-1 and 2-3 have been reorganized by SDU to show a comparison between the current inventory and the disposed inventory. Figures 2-7 through 2-12 present both the current inventory and the disposed inventory for SDU 1, SDU 2, SDU 3, SDU 4, SDU 5, and SDU 6 from SDF start up in FY1990 through FY2020.

Figures 2-7 through 2-12 show that the largest delta between the current inventory and disposed inventory is for SDUs 1 and 4 which have stopped receiving any saltstone from SPF and had large quantities of radionuclides with short half-lives. Figure 2-13 presents the current and disposed inventory for each SDU along with the gallons of Tank 50 material (i.e., salt waste) disposed in each SDU. As seen in Figure 2-13, the inventory in SDU 4 makes up the majority of both the disposed and current inventories, as well as the majority of the gallons disposed, as seen in Figure 2-14.

Figure 2-7: SDU 1 Disposed and Current Inventories through FY2020

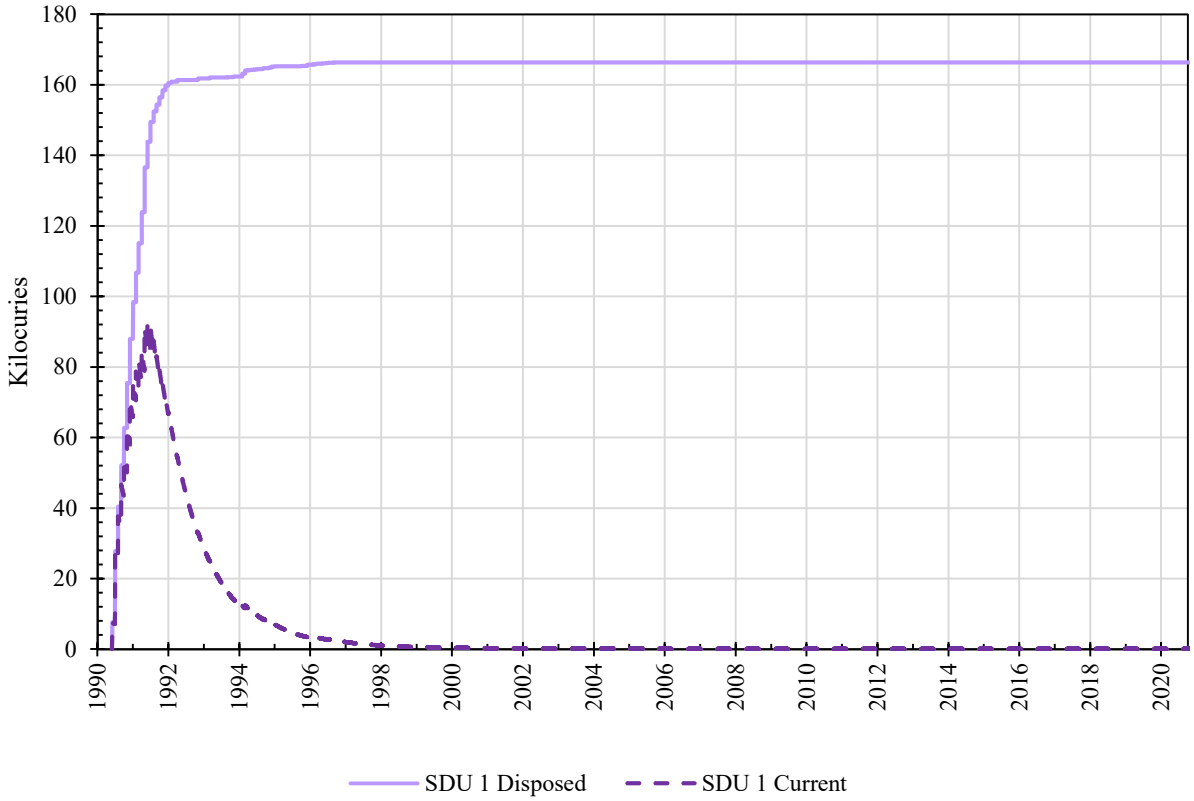


Figure 2-8: SDU 2 Disposed and Current Inventories through FY2020

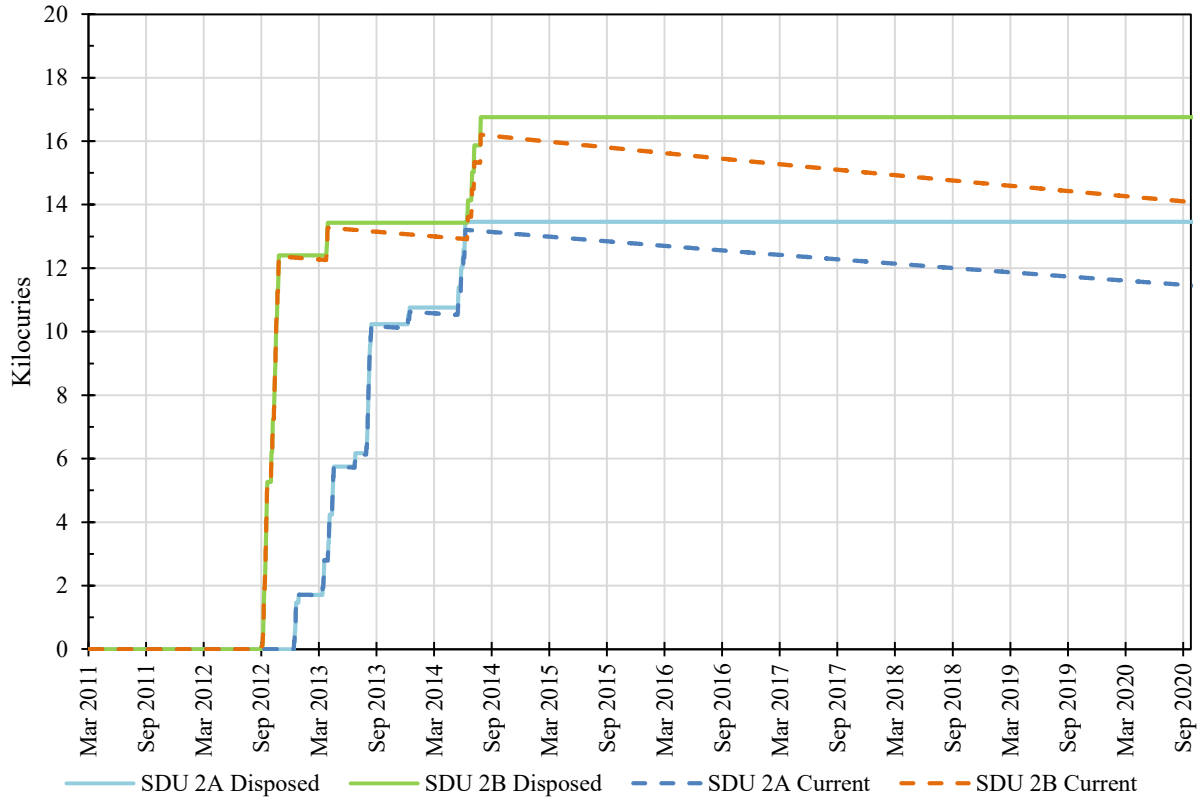
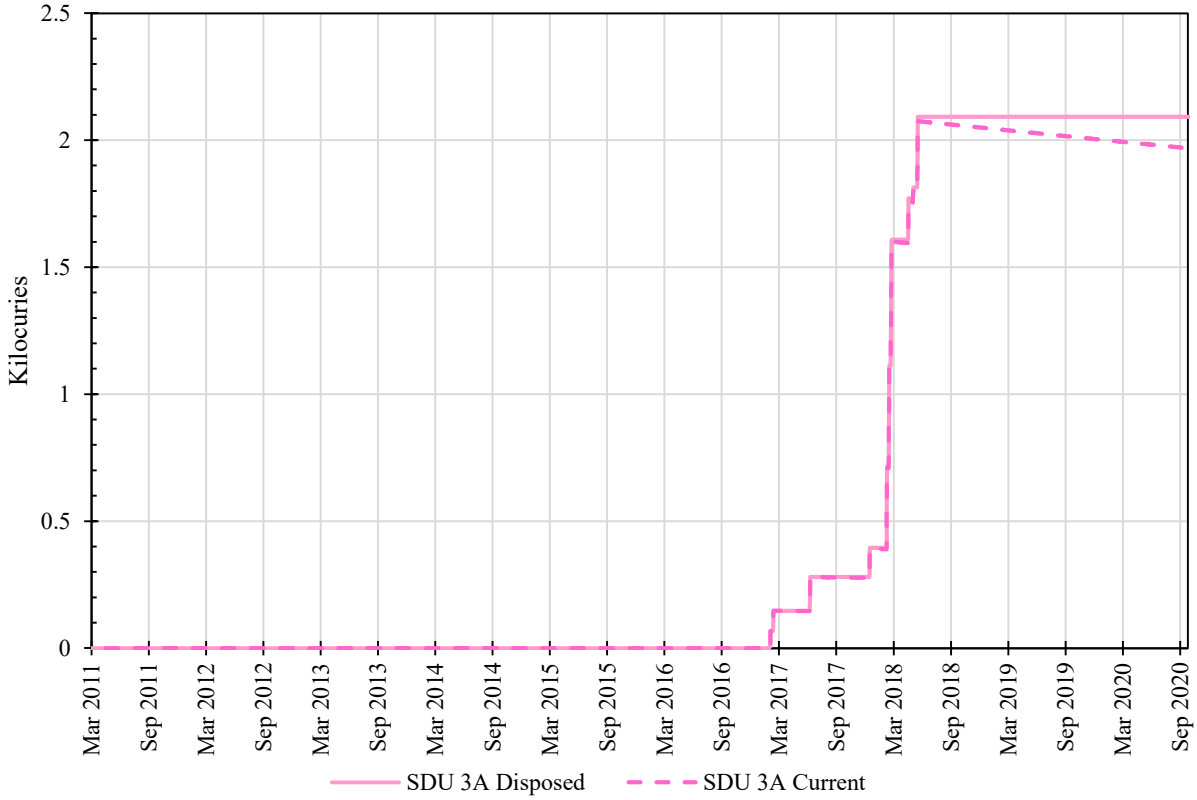


Figure 2-9: SDU 3 Disposed and Current Inventories through FY2020



Note: SDU 3B has received no saltstone grout transfers as of 9/30/2020 and is therefore not included

Figure 2-10: SDU 4 Disposed and Current Inventories through FY2020

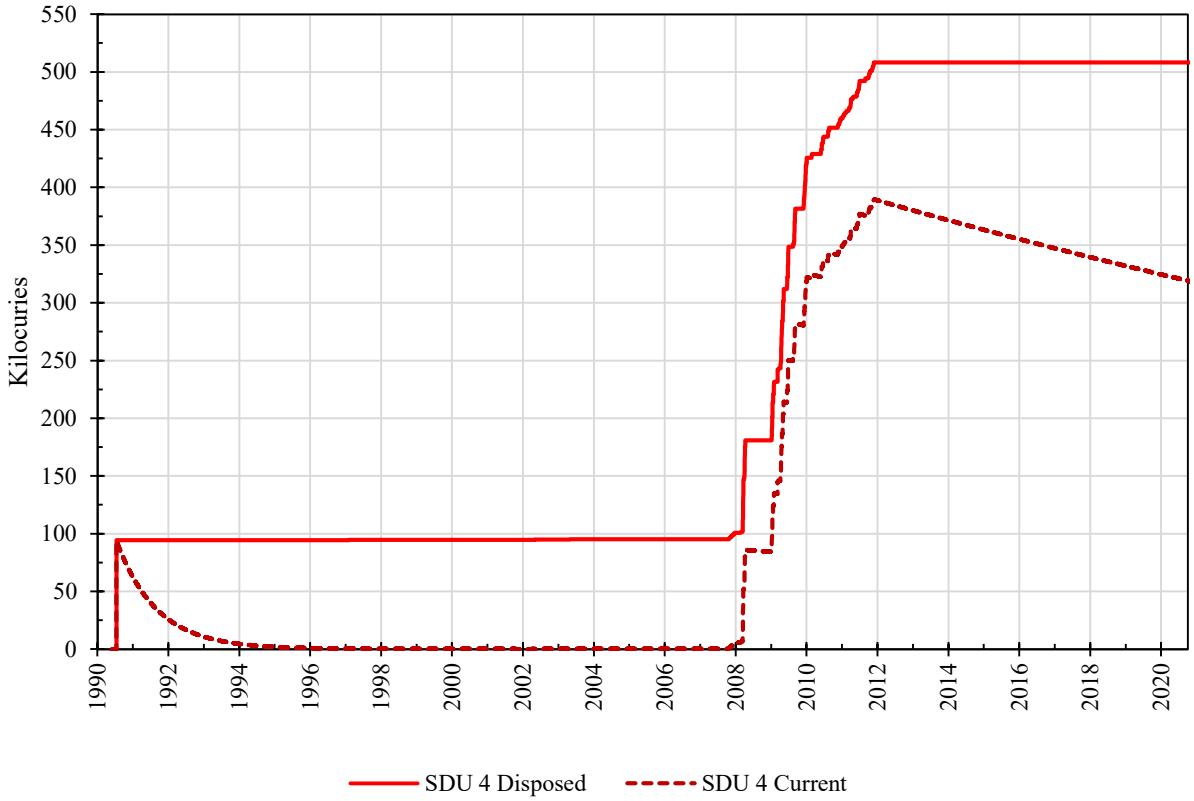


Figure 2-11: SDU 5 Disposed and Current Inventories through FY2020

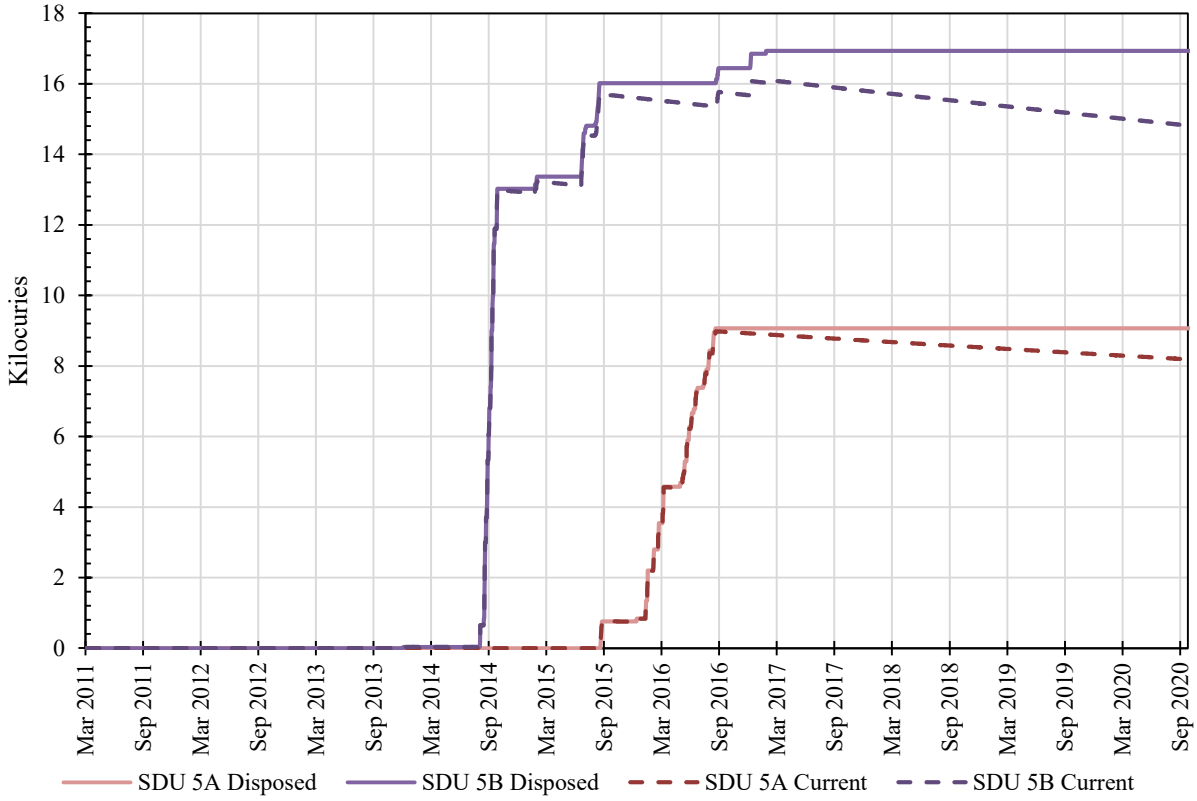


Figure 2-12: SDU 6 Disposed and Current Inventories through FY2020

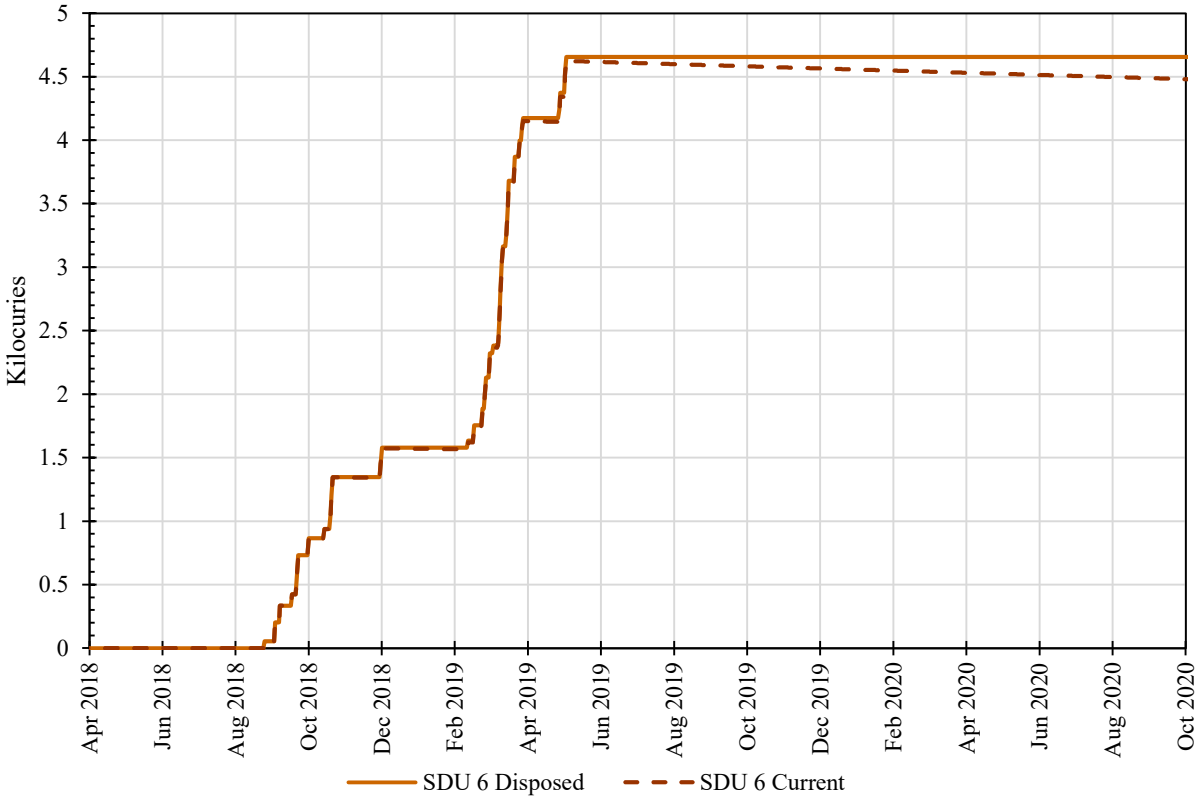
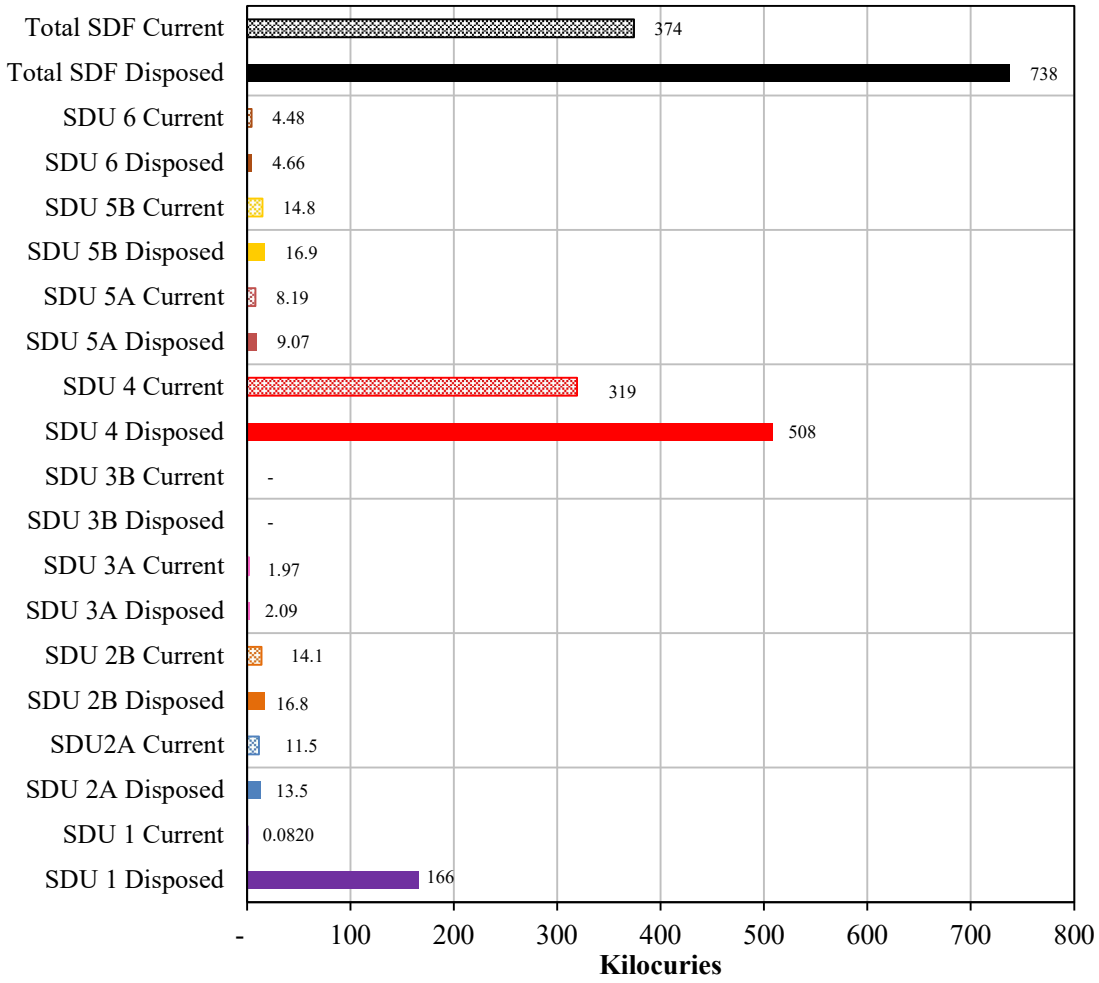
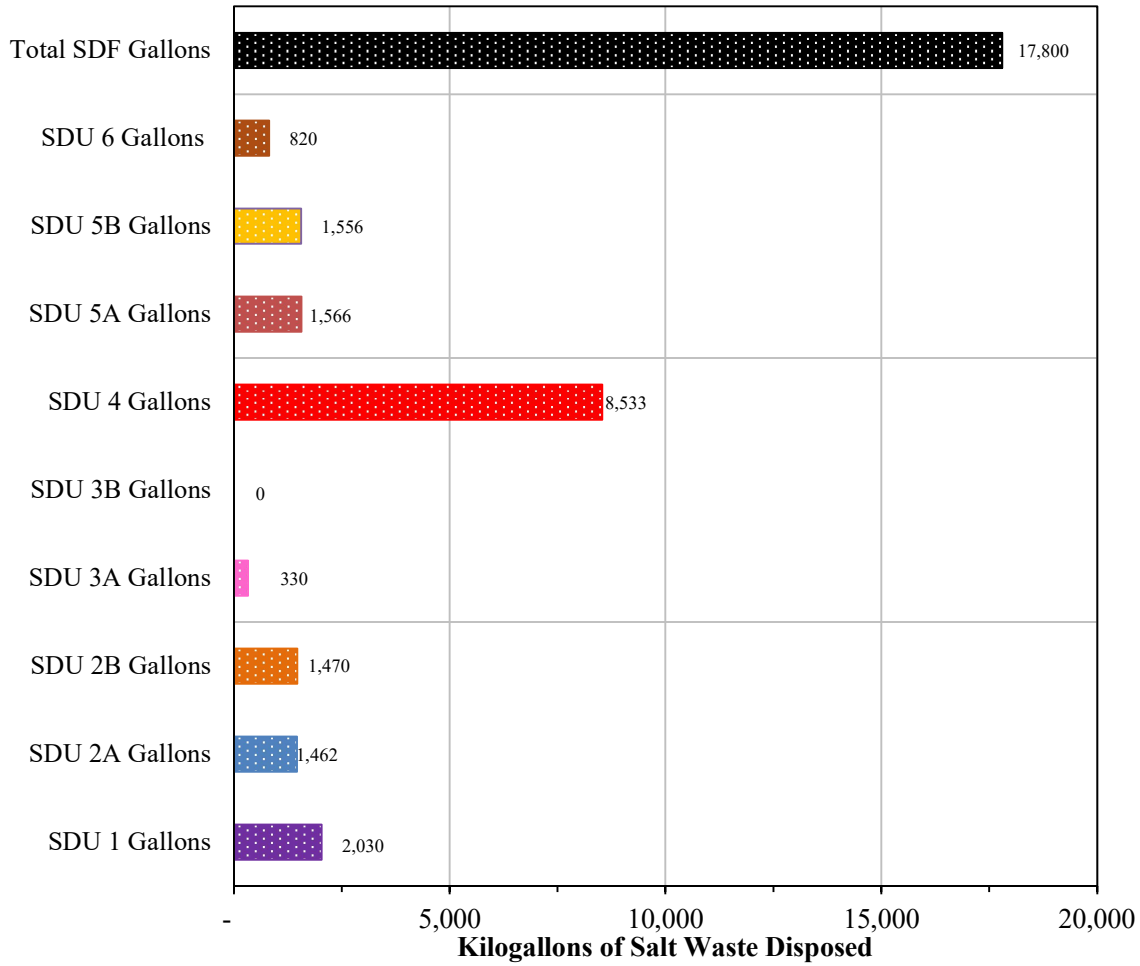


Figure 2-13: SDF Disposed and Current Inventory through FY2020



Note: Radionuclides Ca-41, Mo-93, Ag-108m, Sm-147, Gd-152, Lu-174, Bi-210m, Pb-210, Am-242 and Cm-246 which were previously reported are included as part of the SDU 1 and 4 total inventories here as they were input into the SDF-WIDE model, but totals shown in Tables 2-1 and 2-5 no longer include these radionuclides since they are no longer measured or reported after being screened out as SDF Inventory Radionuclides in SRR-CWDA-2009-00017.

Figure 2-14: SDF Salt Waste Disposed through FY2020



Note: The Total SDF Gallons and SDU 4 Gallons of salt waste disposed is only the gallons of Tank 50 salt solution processed to the SDF. This volume does not consider the volume of material in the SDU 4 from the 10,032 United States Naval fuel Material Facility 55-gallon drums emplaced in Cell A. The volume of material from the 55-gallon drums impacts inventory (i.e., curies) in SDU 4, but not the Tank 50 salt solution processed to SDU 4 since the material was not Tank 50 salt solution.

3.0 REFERENCES

G-CLC-H-00138, *Curies Transferred from Tank 11 to Tank 50 During FY2019*, Savannah River Site, Aiken, SC, Rev. 0, January 2020.

DOE-WD-2005-001, *Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site,* Savannah River Site, Aiken, SC, Rev. 0, January 2006.

LWO-PIT-2007-00083, Chew, D.P., *Evaporator Performance, Tank Space Management, and Liquid Waste Transfers: Fiscal Year 2007 Summary,* Savannah River Site, Aiken, SC, Rev. 1, March 2008.

OCC-11-0070, Ltr, from Knowles, L.M. to Anderson, R.K., *Natural Resources Defense Council, et al v. South Carolina Department of Health and Environmental Control, et al., Docket No. 07-ALJ-07-121-CC*, Savannah River Site, Aiken, SC, Rev. 0, May 2011.

OPS-DTZ-90-0027, Fowler, J. R., *Radionuclide Storage and Disposal in Z-Area*, Savannah River Site, Aiken, SC, Rev. 1, June 17, 1991.

SPD-07-153, Ltr. from Allison, J.M. to Pedde, R.A., *Batch 1 Processing at the Saltstone Facility*, Savannah River Site, Aiken, SC, Rev. 0, February 2007.

SRR-CWDA-2009-00017, *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, Savannah River Site, Aiken, SC, Rev. 0, October 29, 2009.

SRR-CWDA-2015-00003, Hommel, S.P., *Saltstone Disposal Facility Waste Inventory Disposed Estimator Model Report*, Savannah River Site, Aiken, SC, Rev. 0, January 2015.

SRR-CWDA-2015-00033, Interoffice Memorandum, Thomas to Liner, *Description of the Impact of Suspending MST Strikes on Curies Disposed of in the Saltstone Disposal Facility*, Rev. 1, April 20, 2015.

SRR-CWDA-2015-00149, Wooten, L.A., *Determination of the SDF Inventory through 9/30/2015*, Savannah River Site, Aiken, SC, Rev. 1, November 2015.

SRR-CWDA-2016-00111, Wooten, L.A., *Determination of the SDF Inventory through 9/30/2016*, Savannah River Site, Aiken, SC, Rev. 0, November 2016.

SRR-CWDA-2017-00030, Wooten, L.A., *Impact of Suspending Monosodium Titanate Strikes in the Actinide Removal Process on Salt Batch 8B Curies Transferred to Tank 50*, Savannah River Site, Aiken, SC, Rev. 0, July 2017.

SRR-CWDA-2017-00079, Wooten, L.A., *Determination of the SDF Inventory through 9/30/2017*, Savannah River Site, Aiken, SC, Rev. 0, November 2017.

SRR-CWDA-2018-00041, Dixon, K.D., *Determination of Inventory for FY2019 Performance Assessment Modeling*, Savannah River Site, Aiken, SC, Rev. 3, July 11, 2019.

SRR-CWDA-2018-00072, Wooten, L.A., *Determination of the SDF Inventory through 9/30/2018,* Savannah River Site, Aiken, SC, Rev. 0, January 7, 2019.

SRR-CWDA-2019-00110, Dixon, K.D, *Determination of the SDF Inventory through 9/30/2019*, Savannah River Site, Aiken, SC, Rev. 0, January 29, 2020.

SRR-LWP-2009-00001, Chew, D.P., *Liquid Waste System Plan,* Savannah River Site, Aiken, SC, Rev. 21, January 2019.

SRR-LWP-2010-00007, Chew, D.P., *Evaporator Performance, Tank Space Management, and Liquid Waste Transfers: Fiscal Year 2009 Summary,* Savannah River Site, Aiken, SC, Rev. 0, March 2010.

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WSRC-RP-2008-00390, *FY 2007 Annual Review - Saltstone Disposal Facility (Z-Area) Performance Assessment (Covering the Performance Period FY 2007),* Savannah River Site, Aiken, SC, Rev. 0, March 11, 2008.

X-CLC-Z-00070, Utlak, S.A., *3Q14 Saltstone Facility Basis Information for Section III.7 of the Consent Order of Dismissal*, Savannah River Site, Aiken, SC, Rev. 0, November 2014.

X-CLC-Z-00078, Chandler, A.B., *3Q16 Saltstone Facility Basis Information for Section III.7 of the Consent Order of Dismissal*, Savannah River Site, Aiken, SC, Rev. 1, October 2016.

X-CLC-Z-00081, Thompson Jr., T.L., *1Q17 Saltstone Facility Basis Information for Section III.7 of the Consent Order of Dismissal*, Savannah River Site, Aiken, SC, Rev. 0, May 2017.

X-CLC-Z-00085, Harrington, S.J., *2Q18 Saltstone Facility Basis Information for Section III.7 of the Consent Order of Dismissal*, Savannah River Site, Aiken, SC, Rev. 0, September 2018.