Determination of the SDF Inventory through 9/30/2017

November 30, 2017

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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) 2017 (i.e., September 30, 2017). 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 and Sr-90, radionuclides with approximate 30-year half-lives, and their short-lived daughter products, Ba-137m and Y-90, respectively.

In FY2017 alone, 170 kilogallons (kgal) of low-level salt waste was transferred from Tank 50 to the Saltstone Production Facility (SPF). A total of 396 kgal of saltstone containing 0.78 kilocuries (kCi) was emplaced in the SDF. Saltstone was emplaced in Saltstone Disposal Unit (SDU) Cells 3A and 5B. Cesium-137 and its daughter product Ba-137m made up 75% and Sr-90 and its daughter product Y-90 made up 18% of the curies disposed of in FY2017. Table ES-1 summarizes these activities. During FY2017 alone, 8.98 kCi decayed from the SDF inventory, resulting in a net decrease of 8.20 kCi to the SDF current inventory at the end of FY2017.

Table ES-1: FY2017 Saltstone Processing Summary

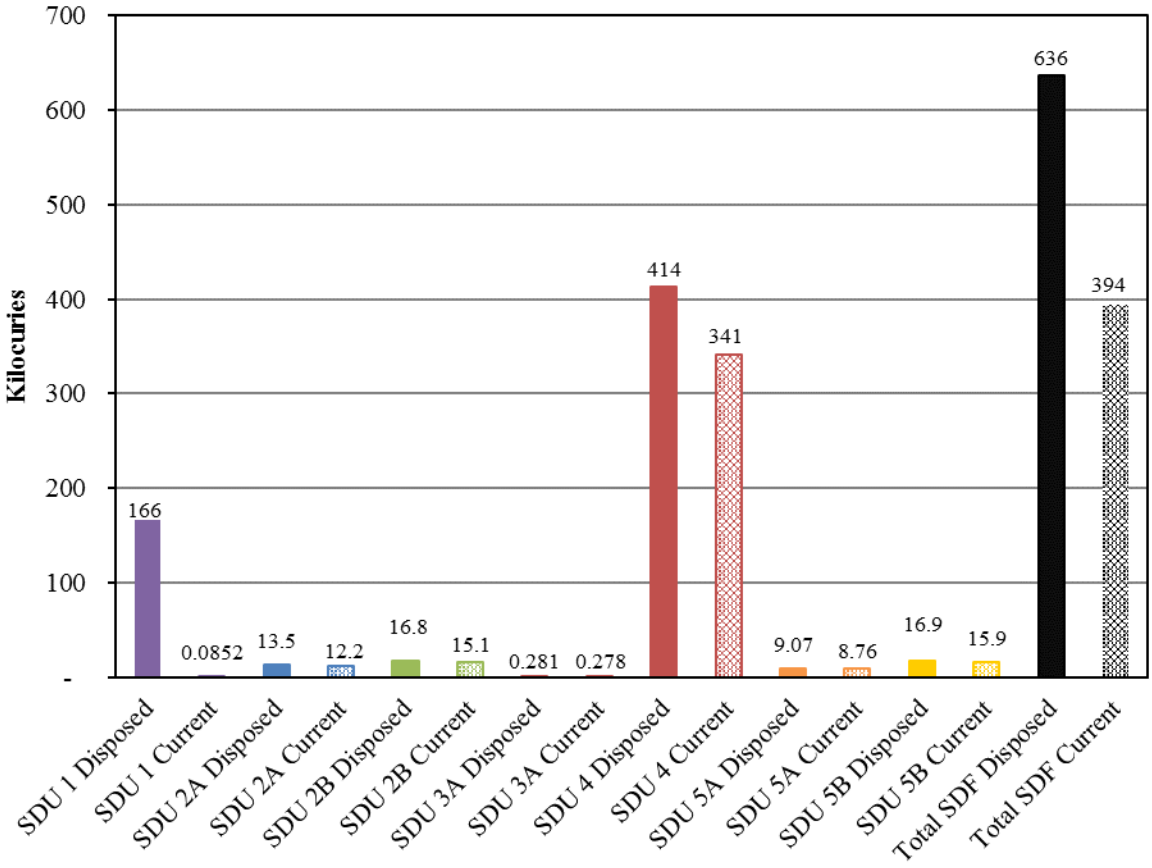
	SDU 3A	SDU 5B	Total
FY2017 Volume of Salt Waste Disposed (kgal)	61.6	108	170
FY2017 Volume of Saltstone Emplaced* (kgal)	198	198	396
FY2017 Curies Disposed (kCi)	0.281	0.495	0.776

*Note: The volume of saltstone grout emplaced is based on a visual inspection of internal SDU grout heights, rather than measured volumetric flow of grout, and is therefore not a precise estimate of processed volume.

Since initiation of operations in June 1990, the SDF has received and disposed of a combined total of 636 kCi in SDU 1 (Vault 1), SDU 2A, SDU 2B, SDU 3A, SDU 4 (Vault 4), SDU 5A and SDU 5B. The current inventory in the SDF as of September 30, 2017 is 394 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 97% 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 FY2017. 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 SDU 5A was filled to its operational capacity; no further disposal to this unit is anticipated. At

the beginning of FY2017, SDUs 3A, 3B, and the remaining space in SDU 5B were available to emplace saltstone.

Figure ES-1: SDF Disposed Inventory and Current Inventory per SDU through FY2017



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, 2017, 469 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, 2017 associated with ISP is 393 kCi. At the end of FY2017 there was a difference of less than one kCi between the current inventory in the SDF since initiation of operations in 1990 (393.7kCi), including ISP operations, and the current inventory in the SDF associated with ISP alone (393.4 kCi).

Table ES-2: SDF Inventory Summary FY1990 through FY2017

	All Salt Processing[1] FY1990-FY2017 kCi		Interim Salt Processing FY2007-FY2017 kCi	
	Disposed	Current	Disposed	Current
SDF Total	636	394	469	393
SDU 1	166	0.0852	0	0
SDU 2A	13.5	12.2	13.5	12.2
SDU 2B	16.8	15.1	16.8	15.1
SDU 3A	0.281	0.278	0.281	0.278
SDU 4	414	341	413	341
SDU 5A	9.07	8.76	9.07	8.76
SDU 5B	16.9	15.9	16.9	15.9

[1] Includes Interim Salt Processing

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ACRONYMS

ARP	Actinide Removal Process
DDA	Deliquification, Dissolution, and Adjustment
DOE	U.S. Department of Energy
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	Modified 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

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 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). Table 1-1 below provides a crosswalk of the source information that was used to develop the inventory (i.e., disposed of and current) attributed to Fiscal Year (FY) 2017 processing. 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). All SDF inventory presented in this document was determined using SDF-WIDE model Version 1.5.

Table 1-1: Crosswalk for FY2017 Inputs

Source for Tank 50 Concentration Data	Source for Tank 50 Transfer Volume and Saltstone Volume Data	Period for Reported Concentration
SRNL-L3100-2016-00229	X-CLC-Z-00080	10/1/2016 – 12/31/2016
SRNL-L3100-2017-00033	X-CLC-Z-00081	1/1/2017 – 3/31/2017
SRNL-L3100-2017-00076	X-CLC-Z-00082	4/1/2017 – 6/30/2017
SRNL-L3100-2017-00116	X-CLC-Z-00083*	7/1/2017 – 9/30/2017

*Note: No processing occurred in the fourth quarter of FY2017

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. 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 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 and is still on-going. 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 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]

This document provides the current inventory of the SDF through FY2017. The current inventory takes into account decay and ingrowth of daughter products. This document also provides the overall disposed inventory at the SDF through FY2017 and the disposed inventory specifically associated with ISP during the period from March 2007 through FY2017.

2.2 Current Inventory

The current inventory at the SDF is the inventory for all waste disposed from June 1990 through FY2017 taking into account radioactive decay and ingrowth. There was no material added to SDU 1, SDU 2A, SDU 2B, SDU 4, or SDU 5A in FY2017, therefore, the changes to those inventories since September 30, 2016 were only due to decay and ingrowth. 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 4 last received waste in November 2011, and SDU 5A last received waste in August 2016. There are no plans to receive any additional waste in these units. [SRR-LWP-2009-00001, X-CLC-Z-00070, X-CLC-Z-00078] The SDF inputs for FY2017 processing are provided in Table 1-1. The SDF inputs from facility startup through FY2014 are provided in *Saltstone Disposal Facility Waste Inventory Disposed Estimator Model Report,* SRR-CWDA-2015-00003, and FY2015 and FY2016 inputs are provided in annual inventory determination reports, SRR-CWDA-2015-00149 and SRR-CWDA-2016-00111 respectively.

Figure 2-1 shows the current inventory at the SDF from FY1990 through FY2017. The current inventory (which includes decay and ingrowth) for the SDF through FY2017 is 394 kCi. The current inventory for each SDU on September 30, 2017 is presented in Figure 2-2.

The current inventory through FY2017 for each radionuclide within each SDU is provided in Tables 2-1 through 2-6. As shown in these tables, the largest contributors to the current inventory in SDUs 2A, 2B, 3A, 4, 5A and 5B are Cs-137 and Ba-137m. Cs-137 and Ba-137m make up 99% of the current inventory in SDU 2A and SDU 2B, 98% of the current inventory in SDU 4, 97% of the current inventory in SDU 5B, 85% of the current inventory in SDU 5A, and 74% of the current inventory in SDU 3A. Tc-99 and H-3 are the largest contributors to the current inventory in SDU 1, with 58% of the inventory being Tc-99 and 16% of the inventory being H-3.

Figure 2-1: SDF Current Inventory through FY2017

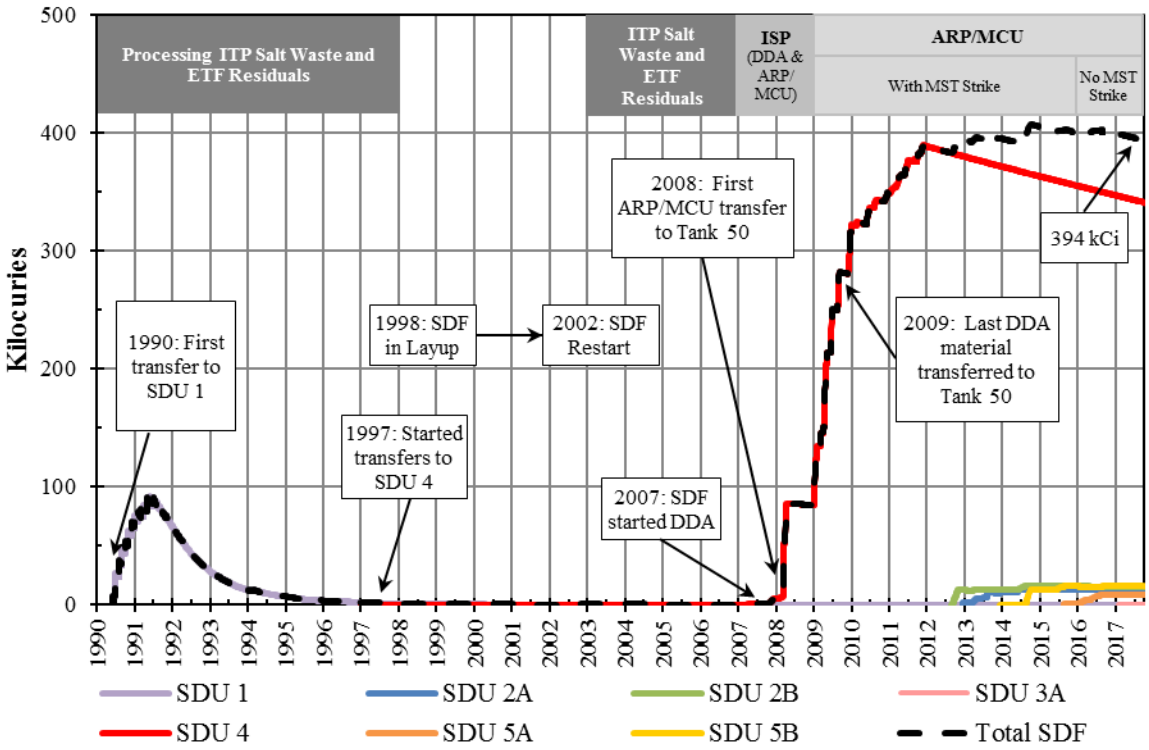


Figure 2-2: Current Inventory of SDUs on September 30, 2017

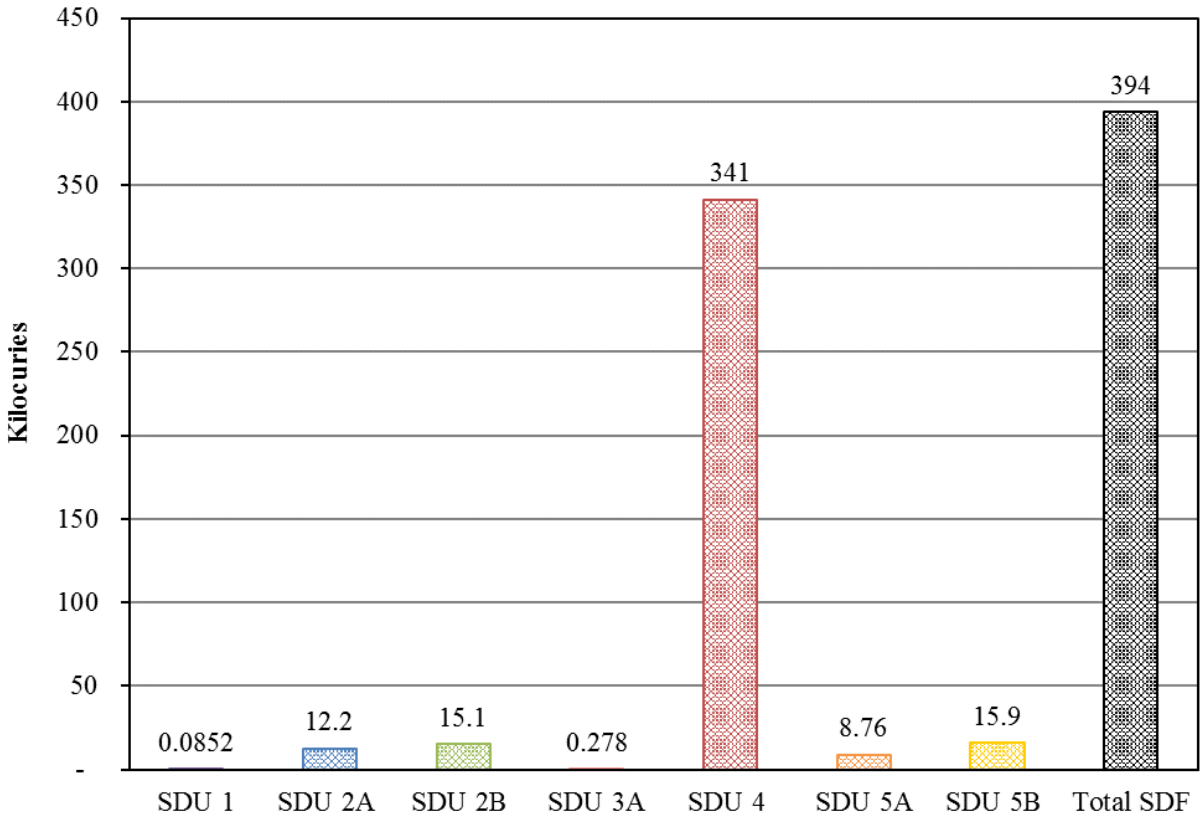


Table 2-1: SDU 1 Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.36E+01	Eu-155	3.81E-04
C-14	1.31E+00	Pt-193	1.64E+00
Na-22	1.51E+00	Ra-226	4.94E-07
Al-26	2.64E-01	Ra-228	7.68E-06
Cl-36	1.93E-07	Ac-227	1.66E-06
K-40	1.93E-07	Th-229	4.05E-04
Co-60	4.40E-04	Th-230	4.75E-05
Ni-59	2.30E-03	Th-232	7.68E-06
Ni-63	1.20E-01	Pa-231	3.07E-06
Se-79	3.44E-01	U-232	6.55E-04
Y-90	1.11E-02	U-233	7.79E-02
Sr-90	1.11E-02	U-234	9.98E-02
Zr-93	7.68E-01	U-235	2.52E-03
Nb-93m	7.56E-01	U-236	6.54E-03
Nb-94	2.03E-03	U-238	1.07E-02
Tc-99	4.93E+01	Np-237	3.94E-03
Ru-106	4.49E-07	Pu-238	7.19E-03
Rh-106	4.49E-07	Pu-239	1.43E-02
Pd-107	8.38E-03	Pu-240	1.35E-02
Sn-126	1.22E+00	Pu-241	2.05E-02
Sb-125	2.32E-02	Pu-242	1.57E-03
Sb-126	1.71E-01	Pu-244	1.01E-05
Sb-126m	1.22E+00	Am-241	1.96E-03
Te-125m	5.68E-03	Am-242m	6.81E-05
I-129	2.01E-01	Am-243	1.42E-03
Cs-134	8.50E-04	Cm-242	6.58E-06
Cs-135	9.75E-02	Cm-243	4.64E-04
Cs-137	6.35E+00	Cm-244	3.02E-03
Ba-137m	5.99E+00	Cm-245	2.73E-04
Pr-144	7.38E-06	Cm-247	1.61E-13
Ce-144	7.45E-06	Cm-248	1.68E-13
Pm-147	2.89E-03	Bk-249	1.60E-24
Sm-151	5.54E-03	Cf-249	8.86E-13
Eu-152	1.55E-03	Cf-251	3.11E-14
Eu-154	5.32E-04	Cf-252	4.81E-17
		Total	**8.52E+01**

Table 2-2: SDU 2 Cell A Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	2.35E+00	Eu-155	3.51E-03
C-14	2.41E+00	Pt-193	1.57E+00
Na-22	1.04E+00	Ra-226	1.54E-06
Al-26	8.98E-04	Ra-228	1.26E-05
Cl-36	1.86E-04	Ac-227	6.58E-07
K-40	1.86E-04	Th-229	2.69E-03
Co-60	9.39E-04	Th-230	7.91E-04
Ni-59	9.16E-04	Th-232	1.26E-05
Ni-63	4.45E-02	Pa-231	1.21E-06
Se-79	1.34E-01	U-232	1.38E-02
Y-90	1.68E+01	U-233	9.51E-01
Sr-90	1.68E+01	U-234	6.16E-01
Zr-93	2.64E-01	U-235	9.93E-04
Nb-93m	2.79E-01	U-236	6.37E-03
Nb-94	1.90E-03	U-238	2.24E-02
Tc-99	1.14E+02	Np-237	1.60E-01
Ru-106	8.04E-04	Pu-238	5.72E+00
Rh-106	8.04E-04	Pu-239	5.28E-01
Pd-107	6.03E-03	Pu-240	5.28E-01
Sn-126	7.62E-01	Pu-241	1.68E+00
Sb-125	9.55E-02	Pu-242	3.76E-01
Sb-126	1.07E-01	Pu-244	1.74E-03
Sb-126m	7.62E-01	Am-241	5.94E-02
Te-125m	2.34E-02	Am-242m	9.99E-03
I-129	7.31E-02	Am-243	4.20E-03
Cs-134	1.14E-01	Cm-242	1.57E-04
Cs-135	4.01E-02	Cm-243	5.41E-04
Cs-137	6.21E+03	Cm-244	1.97E-01
Ba-137m	5.86E+03	Cm-245	1.45E-02
Pr-144	4.36E-06	Cm-247	1.67E-02
Ce-144	4.40E-06	Cm-248	1.21E-13
Pm-147	7.69E-02	Bk-249	9.66E-25
Sm-151	1.67E-01	Cf-249	1.78E-02
Eu-152	2.62E-04	Cf-251	1.34E-02
Eu-154	8.36E-03	Cf-252	3.30E-17
		Total	**1.22E+04**

Table 2-3: SDU 2 Cell B Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	1.99E+00	Eu-155	3.52E-03
C-14	2.44E+00	Pt-193	1.56E+00
Na-22	1.04E+00	Ra-226	9.50E-07
Al-26	8.55E-04	Ra-228	1.92E-05
Cl-36	2.32E-04	Ac-227	8.44E-07
K-40	2.32E-04	Th-229	6.02E-03
Co-60	1.05E-03	Th-230	4.04E-04
Ni-59	7.32E-04	Th-232	1.92E-05
Ni-63	3.54E-02	Pa-231	1.55E-06
Se-79	1.23E-01	U-232	1.34E-02
Y-90	2.07E+01	U-233	1.32E+00
Sr-90	2.07E+01	U-234	8.54E-01
Zr-93	3.83E-01	U-235	1.27E-03
Nb-93m	4.24E-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	5.88E-04	Pu-238	5.44E+00
Rh-106	5.88E-04	Pu-239	5.19E-01
Pd-107	6.06E-03	Pu-240	5.19E-01
Sn-126	6.83E-01	Pu-241	1.59E+00
Sb-125	3.02E-01	Pu-242	5.21E-01
Sb-126	9.56E-02	Pu-244	2.42E-03
Sb-126m	6.83E-01	Am-241	7.37E-02
Te-125m	7.40E-02	Am-242m	6.35E-03
I-129	6.83E-02	Am-243	4.88E-03
Cs-134	9.04E-02	Cm-242	1.00E-04
Cs-135	4.03E-02	Cm-243	5.37E-04
Cs-137	7.65E+03	Cm-244	2.24E-01
Ba-137m	7.22E+03	Cm-245	2.22E-02
Pr-144	4.41E-06	Cm-247	1.41E-02
Ce-144	4.45E-06	Cm-248	1.21E-13
Pm-147	5.96E-02	Bk-249	9.76E-25
Sm-151	1.46E-01	Cf-249	1.47E-02
Eu-152	2.63E-04	Cf-251	1.08E-02
Eu-154	1.50E-02	Cf-252	3.32E-17
		Total	**1.51E+04**

Table 2-4: SDU 3 Cell A Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	3.04E-01	Eu-155	5.43E-04
C-14	1.35E-01	Pt-193	6.94E-02
Na-22	4.35E-02	Ra-226	6.30E-09
Al-26	2.26E-05	Ra-228	4.68E-07
Cl-36	2.65E-04	Ac-227	3.41E-08
K-40	2.65E-04	Th-229	5.87E-06
Co-60	6.56E-05	Th-230	2.76E-06
Ni-59	4.05E-05	Th-232	4.68E-07
Ni-63	2.02E-03	Pa-231	6.26E-08
Se-79	6.59E-03	U-232	7.02E-04
Y-90	2.61E+01	U-233	4.12E-02
Sr-90	2.61E+01	U-234	2.67E-02
Zr-93	1.74E-02	U-235	5.14E-05
Nb-93m	2.32E-02	U-236	3.07E-04
Nb-94	8.85E-05	U-238	9.46E-04
Tc-99	1.10E+01	Np-237	3.00E-03
Ru-106	4.36E-04	Pu-238	6.48E+00
Rh-106	4.36E-04	Pu-239	1.56E-01
Pd-107	2.54E-04	Pu-240	1.56E-01
Sn-126	1.12E-01	Pu-241	2.36E+00
Sb-125	2.32E-03	Pu-242	1.63E-02
Sb-126	1.57E-02	Pu-244	7.56E-05
Sb-126m	1.12E-01	Am-241	3.26E-03
Te-125m	8.05E-04	Am-242m	8.35E-06
I-129	9.13E-03	Am-243	9.18E-05
Cs-134	1.55E-02	Cm-242	3.55E-06
Cs-135	1.69E-03	Cm-243	2.49E-05
Cs-137	1.05E+02	Cm-244	4.54E-04
Ba-137m	9.94E+01	Cm-245	4.87E-04
Pr-144	1.81E-07	Cm-247	7.72E-04
Ce-144	1.83E-07	Cm-248	5.08E-15
Pm-147	8.28E-03	Bk-249	4.00E-26
Sm-151	8.42E-03	Cf-249	8.09E-04
Eu-152	1.10E-05	Cf-251	5.54E-04
Eu-154	1.61E-04	Cf-252	1.38E-18
		Total	**2.78E+02**

Table 2-5: SDU 4 Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	2.47E+01	Eu-155	6.80E-01
C-14	6.51E+00	Pt-193	8.46E+00
Na-22	4.54E+00	Ra-226	2.18E-05
Al-26	9.08E-01	Ra-228	2.08E-04
Cl-36	2.94E-02	Ac-227	2.21E-05
K-40	2.94E-02	Th-229	3.63E+00
Co-60	5.84E-02	Th-230	3.04E-03
Ni-59	7.89E-02	Th-232	2.08E-04
Ni-63	3.13E+00	Pa-231	4.09E-05
Se-79	9.75E+00	U-232	1.18E-01
Y-90	2.38E+03	U-233	8.85E+00
Sr-90	2.38E+03	U-234	5.77E+00
Zr-93	7.94E+00	U-235	3.38E-02
Nb-93m	8.41E+02	U-236	8.12E-02
Nb-94	8.93E-02	U-238	7.92E-02
Tc-99	6.34E+02	Np-237	5.76E-01
Ru-106	3.32E-03	Pu-238	3.13E+02
Rh-106	3.32E-03	Pu-239	5.86E+01
Pd-107	3.52E-02	Pu-240	7.28E+01
Sn-126	2.22E+00	Pu-241	9.04E+01
Sb-125	2.79E+01	Pu-242	4.12E+00
Sb-126	3.11E-01	Pu-244	1.68E-02
Sb-126m	2.22E+00	Am-241	2.05E+01
Te-125m	6.83E+00	Am-242m	1.91E-02
I-129	2.77E-01	Am-243	5.17E-01
Cs-134	1.48E+00	Cm-242	6.26E-04
Cs-135	1.78E+00	Cm-243	8.23E-03
Cs-137	1.70E+05	Cm-244	3.26E+01
Ba-137m	1.61E+05	Cm-245	7.78E-01
Pr-144	3.15E-04	Cm-247	1.06E-01
Ce-144	3.18E-04	Cm-248	7.04E-13
Pm-147	3.75E+00	Bk-249	1.66E-23
Sm-151	1.97E+01	Cf-249	2.77E-01
Eu-152	7.40E-02	Cf-251	9.31E-02
Eu-154	3.17E+00	Cf-252	2.32E-16
		Total	**3.38E+05***

*Note: The SDU 4 current inventory total no longer includes 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; these radionuclides are no longer measured or reported as they were screened out as SDF Inventory Radionuclides by the 2009 SDF Performance Assessment (SRR-CWDA-2009-00017).

Table 2-6: SDU 5 Cell A Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	5.72E+00	Eu-155	1.67E-02
C-14	3.18E+00	Pt-193	1.74E+00
Na-22	1.11E+00	Ra-226	2.58E-07
Al-26	1.02E-03	Ra-228	1.35E-05
Cl-36	5.07E-03	Ac-227	4.38E-05
K-40	5.07E-03	Th-229	3.28E-04
Co-60	2.48E-02	Th-230	1.79E-04
Ni-59	1.26E-03	Th-232	1.35E-05
Ni-63	6.22E-02	Pa-231	1.87E-06
Se-79	2.72E-01	U-232	1.45E-02
Y-90	4.93E+02	U-233	1.17E+00
Sr-90	4.93E+02	U-234	7.56E-01
Zr-93	3.05E-01	U-235	1.53E-03
Nb-93m	5.43E-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	9.51E-03	Pu-238	7.59E+01
Rh-106	9.51E-03	Pu-239	1.86E+00
Pd-107	6.46E-03	Pu-240	1.86E+00
Sn-126	1.65E+00	Pu-241	2.66E+01
Sb-125	4.35E-02	Pu-242	4.61E-01
Sb-126	2.31E-01	Pu-244	2.14E-03
Sb-126m	1.65E+00	Am-241	8.37E-02
Te-125m	1.08E-02	Am-242m	1.01E-03
I-129	1.39E-01	Am-243	3.90E-03
Cs-134	2.91E-01	Cm-242	1.05E-04
Cs-135	4.29E-02	Cm-243	6.19E-04
Cs-137	3.84E+03	Cm-244	9.77E-02
Ba-137m	3.63E+03	Cm-245	1.50E-02
Pr-144	4.62E-06	Cm-247	2.13E-02
Ce-144	4.67E-06	Cm-248	1.29E-13
Pm-147	1.80E-01	Bk-249	1.02E-24
Sm-151	2.58E-01	Cf-249	2.23E-02
Eu-152	2.80E-04	Cf-251	1.68E-02
Eu-154	4.33E-03	Cf-252	3.52E-17
		Total	**8.76E+03**

Table 2-7: SDU 5 Cell B Current Inventory on September 30, 2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	3.52E+00	Eu-155	7.70E-03
C-14	3.78E+00	Pt-193	1.71E+00
Na-22	1.11E+00	Ra-226	2.96E-07
Al-26	8.59E-04	Ra-228	2.26E-05
Cl-36	1.26E-03	Ac-227	7.27E-05
K-40	2.09E-03	Th-229	3.12E-04
Co-60	1.14E-03	Th-230	1.66E-04
Ni-59	5.15E-04	Th-232	2.26E-05
Ni-63	2.53E-02	Pa-231	1.54E-06
Se-79	1.68E-01	U-232	1.98E-02
Y-90	1.23E+02	U-233	1.07E+00
Sr-90	1.23E+02	U-234	6.87E-01
Zr-93	2.86E-01	U-235	1.27E-03
Nb-93m	3.16E-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	4.37E-03	Pu-238	2.62E+01
Rh-106	4.37E-03	Pu-239	7.39E-01
Pd-107	6.42E-03	Pu-240	7.39E-01
Sn-126	9.47E-01	Pu-241	8.81E+00
Sb-125	3.12E-02	Pu-242	4.21E-01
Sb-126	1.33E-01	Pu-244	1.95E-03
Sb-126m	9.47E-01	Am-241	3.89E-02
Te-125m	7.80E-03	Am-242m	8.34E-04
I-129	8.68E-02	Am-243	9.21E-03
Cs-134	2.65E-01	Cm-242	5.77E-05
Cs-135	4.26E-02	Cm-243	6.01E-04
Cs-137	7.95E+03	Cm-244	1.11E-01
Ba-137m	7.50E+03	Cm-245	1.30E-02
Pr-144	4.80E-06	Cm-247	1.77E-02
Ce-144	4.84E-06	Cm-248	1.28E-13
Pm-147	1.43E-01	Bk-249	1.06E-24
Sm-151	2.13E-01	Cf-249	1.83E-02
Eu-152	2.79E-04	Cf-251	1.52E-02
Eu-154	4.51E-03	Cf-252	3.54E-17
		Total	**1.59E+04**

2.3 Disposed Inventory

The disposed inventory at the SDF from startup in FY1990 through FY2017 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 FY2017 is 636 kCi. The majority of this inventory is emplaced in SDU 4.

Figure 2-3: SDF Disposed Inventory through FY2017

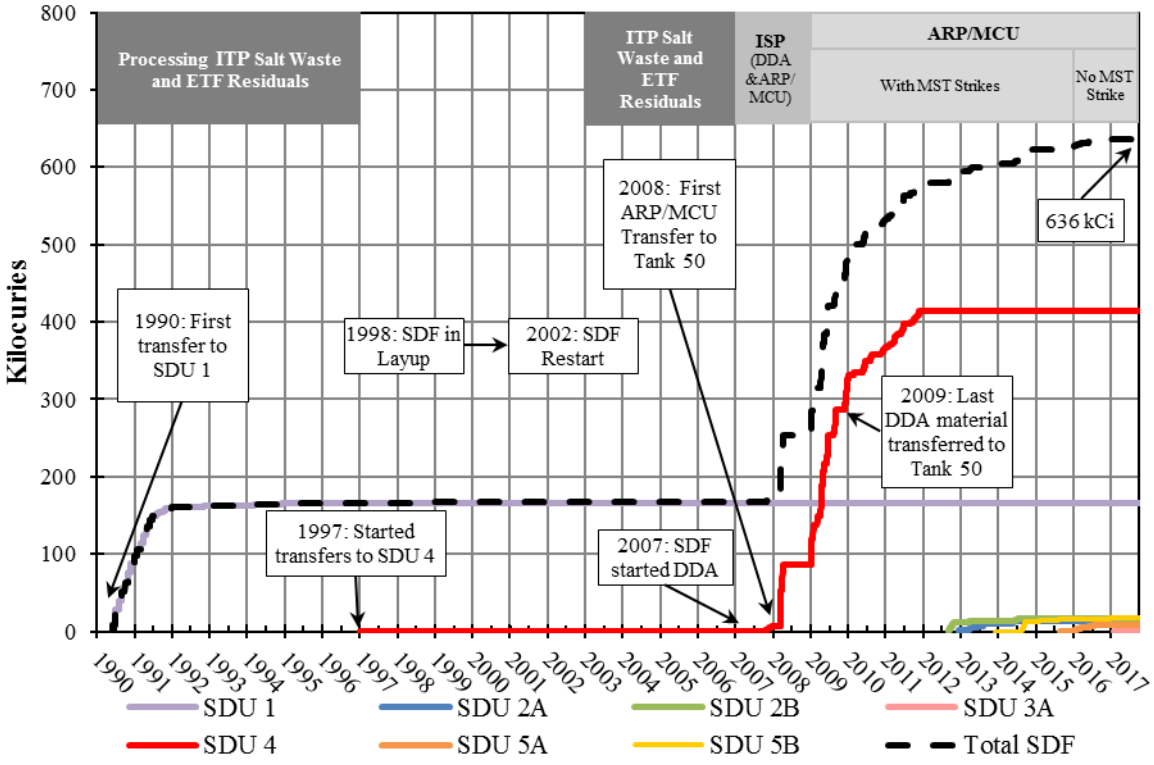
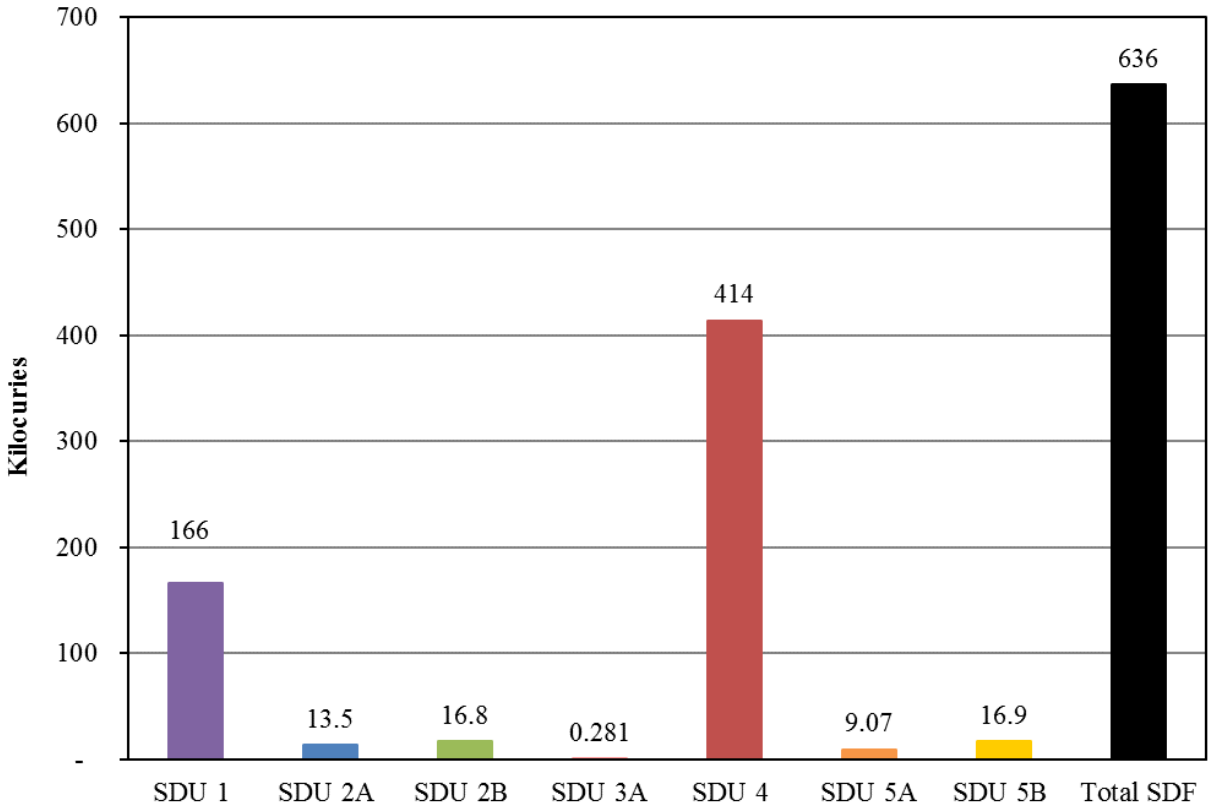


Figure 2-4: Disposed Inventory of SDUs through FY2017



2.3.1 FY2017 Saltstone Processing

In FY2017 alone, 170 kgal of low-level salt waste was transferred from Tank 50 to the SPF. A total of 396 kgal of saltstone containing 0.78 kCi was disposed of in the SDF. Saltstone was emplaced in SDU Cells 3A and 5B. Input for these transfers is shown in Table 1-1. The entire SDF inventory underwent a total of 8.98 kCi of decay during FY2017, resulting in a net decrease of 8.20 kCi to the SDF current inventory at the end of FY2017.

Table 2-7 presents a summary of the processing done in FY2017. Tables 2-8 and 2-9 present the disposed inventory for each radionuclide within SDUs 3A and 5B associated with FY2017 processing alone. As seen in Tables 2-8 and 2-9 and Figure 2-5, Cs-137 and its daughter product Ba-137m make up 75% and Sr-90 and its daughter product Y-90 make up 18% of the curies disposed in FY2017. Previously, Cs-137 and Ba-137m have made up a higher percentage of the disposed inventory; however, as a result of discontinuing MST strikes in ARP in January 2016, a larger portion of the total disposed curies in the SDF are associated with Sr-90 and its short-lived daughter product Y-90.

Table 2-8: FY2017 Saltstone Processing Summary

	SDU 3A	SDU 5B	Total
FY2017 Volume of Salt Waste Disposed (kgal)	61.6	108	170
FY2017 Volume of Saltstone Emplaced* (kgal)	198	198	396
FY2017 Curies Disposed (kCi)	0.281	0.495	0.776

*Note: The volume of saltstone grout emplaced is based on a visual inspection of internal SDU grout heights, rather than measured volumetric flow of grout, and is therefore not a precise estimate of processed volume.

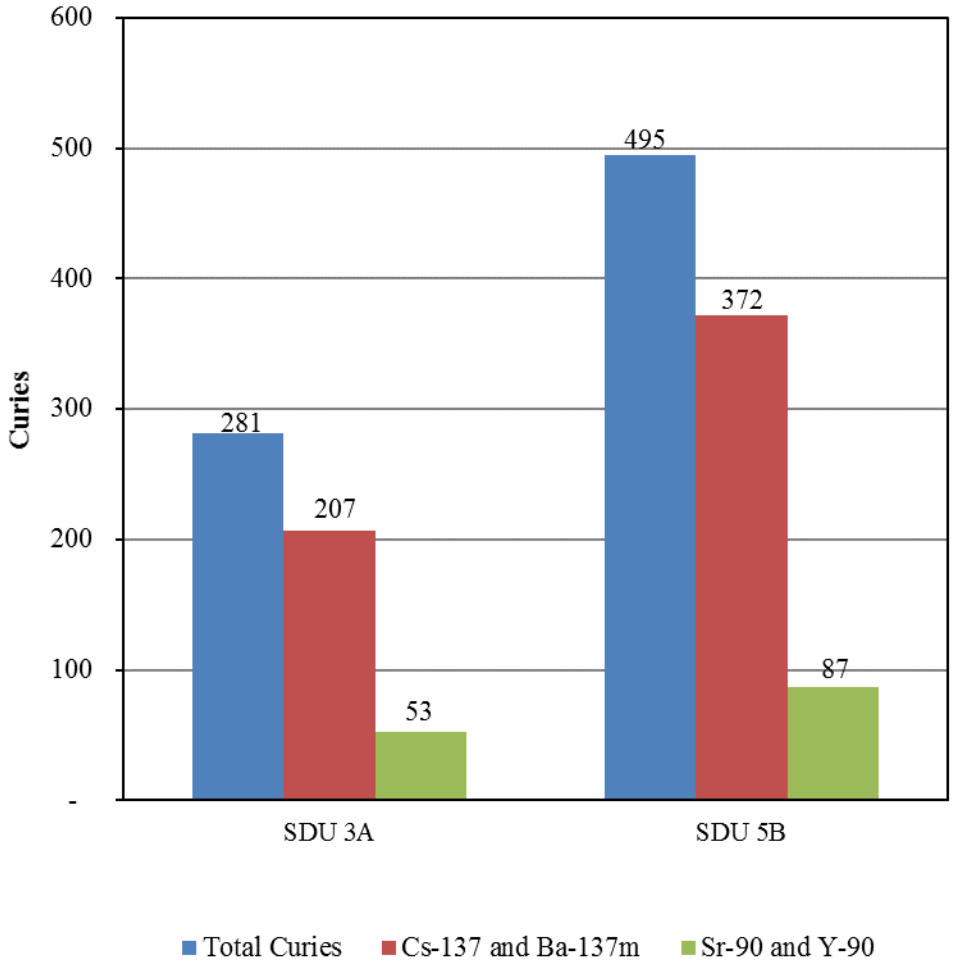
Table 2-9: SDU 3 Cell A Disposed Inventory in FY2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	3.13E-01	Eu-155	5.85E-04
C-14	1.35E-01	Pt-193	7.00E-02
Na-22	5.03E-02	Ra-226	5.70E-09
Al-26	2.26E-05	Ra-228	4.68E-07
Cl-36	2.65E-04	Ac-227	3.36E-08
K-40	2.65E-04	Th-229	4.03E-06
Co-60	7.07E-05	Th-230	2.64E-06
Ni-59	4.05E-05	Th-232	4.68E-07
Ni-63	2.02E-03	Pa-231	6.20E-08
Se-79	6.59E-03	U-232	7.06E-04
Y-90	2.65E+01	U-233	4.12E-02
Sr-90	2.65E+01	U-234	2.66E-02
Zr-93	1.74E-02	U-235	5.14E-05
Nb-93m	2.33E-02	U-236	3.07E-04
Nb-94	8.85E-05	U-238	9.46E-04
Tc-99	1.10E+01	Np-237	3.00E-03
Ru-106	6.25E-04	Pu-238	6.51E+00
Rh-106	6.25E-04	Pu-239	1.56E-01
Pd-107	2.54E-04	Pu-240	1.56E-01
Sn-126	1.12E-01	Pu-241	2.42E+00
Sb-125	2.65E-03	Pu-242	1.63E-02
Sb-126	1.57E-02	Pu-244	7.56E-05
Sb-126m	1.12E-01	Am-241	1.20E-03
Te-125m	2.65E-03	Am-242m	8.37E-06
I-129	9.13E-03	Am-243	9.18E-05
Cs-134	1.84E-02	Cm-242	6.86E-06
Cs-135	1.69E-03	Cm-243	2.52E-05
Cs-137	1.06E+02	Cm-244	4.62E-04
Ba-137m	1.01E+02	Cm-245	4.87E-04
Pr-144	2.97E-07	Cm-247	7.72E-04
Ce-144	2.97E-07	Cm-248	5.08E-15
Pm-147	9.53E-03	Bk-249	6.07E-26
Sm-151	8.45E-03	Cf-249	8.10E-04
Eu-152	1.13E-05	Cf-251	5.54E-04
Eu-154	1.68E-04	Cf-252	1.59E-18
		Total	**2.81E+02**

Table 2-10: SDU 5 Cell B Disposed Inventory in FY2017

Radionuclide	Activity (Ci)	Radionuclide	Activity (Ci)
H-3	5.75E-01	Eu-155	1.01E-03
C-14	2.47E-01	Pt-193	1.23E-01
Na-22	9.51E-02	Ra-226	9.95E-09
Al-26	4.61E-05	Ra-228	7.47E-07
Cl-36	4.36E-04	Ac-227	6.80E-08
K-40	1.26E-03	Th-229	1.21E-05
Co-60	1.45E-04	Th-230	9.71E-06
Ni-59	3.68E-05	Th-232	7.47E-07
Ni-63	1.84E-03	Pa-231	1.26E-07
Se-79	9.95E-03	U-232	1.66E-03
Y-90	4.36E+01	U-233	6.58E-02
Sr-90	4.36E+01	U-234	4.24E-02
Zr-93	3.42E-02	U-235	1.05E-04
Nb-93m	4.09E-02	U-236	4.96E-04
Nb-94	5.61E-05	U-238	2.05E-03
Tc-99	1.81E+01	Np-237	4.80E-03
Ru-106	1.11E-03	Pu-238	1.15E+01
Rh-106	1.11E-03	Pu-239	2.88E-01
Pd-107	4.46E-04	Pu-240	2.88E-01
Sn-126	1.75E-01	Pu-241	4.14E+00
Sb-125	4.79E-03	Pu-242	2.60E-02
Sb-126	2.45E-02	Pu-244	1.21E-04
Sb-126m	1.75E-01	Am-241	2.39E-03
Te-125m	4.79E-03	Am-242m	4.45E-05
I-129	1.48E-02	Am-243	1.56E-04
Cs-134	2.69E-02	Cm-242	3.65E-05
Cs-135	2.96E-03	Cm-243	4.42E-05
Cs-137	1.91E+02	Cm-244	1.04E-03
Ba-137m	1.81E+02	Cm-245	6.95E-04
Pr-144	6.71E-07	Cm-247	9.93E-04
Ce-144	6.71E-07	Cm-248	8.92E-15
Pm-147	1.65E-02	Bk-249	1.33E-25
Sm-151	1.18E-02	Cf-249	1.02E-03
Eu-152	2.02E-05	Cf-251	8.19E-04
Eu-154	2.59E-04	Cf-252	3.01E-18
		Total	**4.95E+02**

Figure 2-5: Cs-137 and Ba-137m and Sr-90 and Y-90 in Disposed Inventory during FY2017



2.3.2 Inventory Disposed During Interim Salt Processing

In March 2007, the SDF began emplacing saltstone containing DSS associated with ISP. Figure 2-6 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 FY2017 is 469 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 and SDU 5B) have each received a significant volume of DSS. SDUs 2A, 2B and 5A are considered completely filled. Figure 2-7 depicts the total number of gallons of salt waste disposed at the SDF from March 2007 through FY2017. As shown in the figure, the total volume disposed from March 2007 through FY2017 is 12,500 kgal.

Figure 2-6: SDF Disposed Curies through FY2017 – Beginning with Start of Interim Salt Processing (DDA & ARP/MCU)

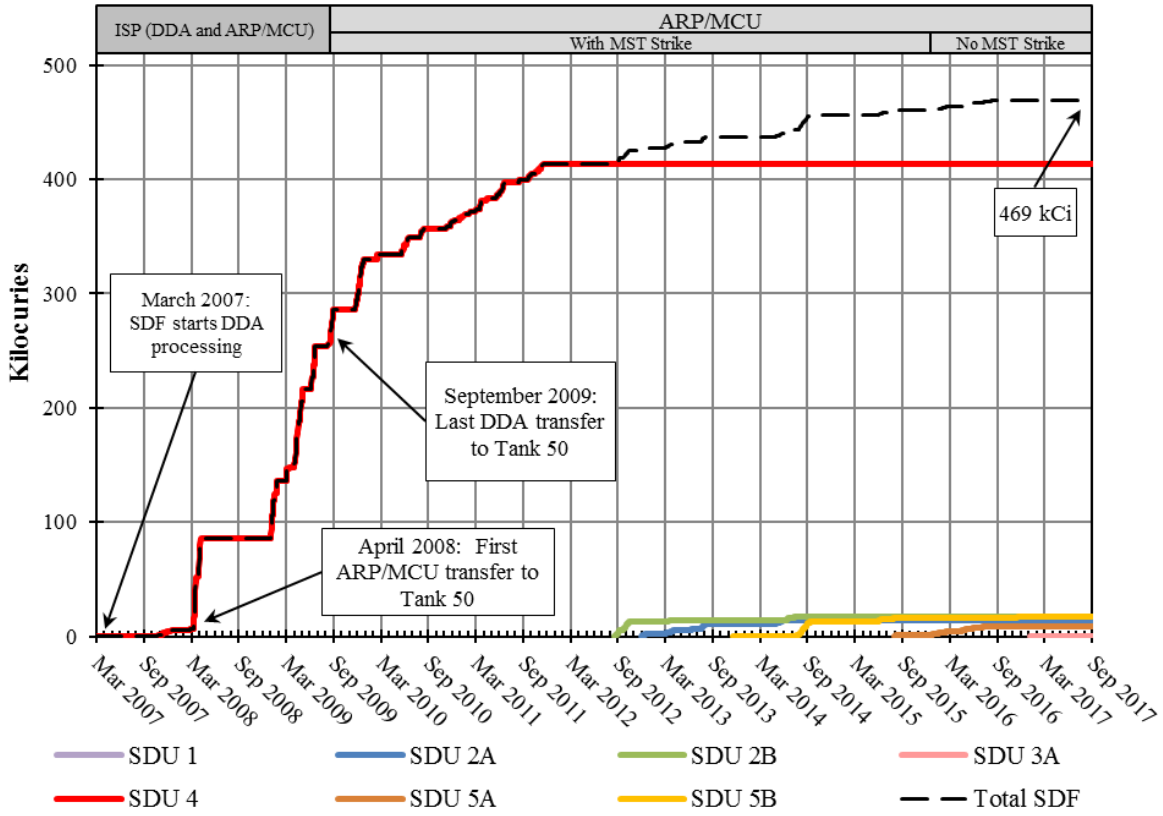
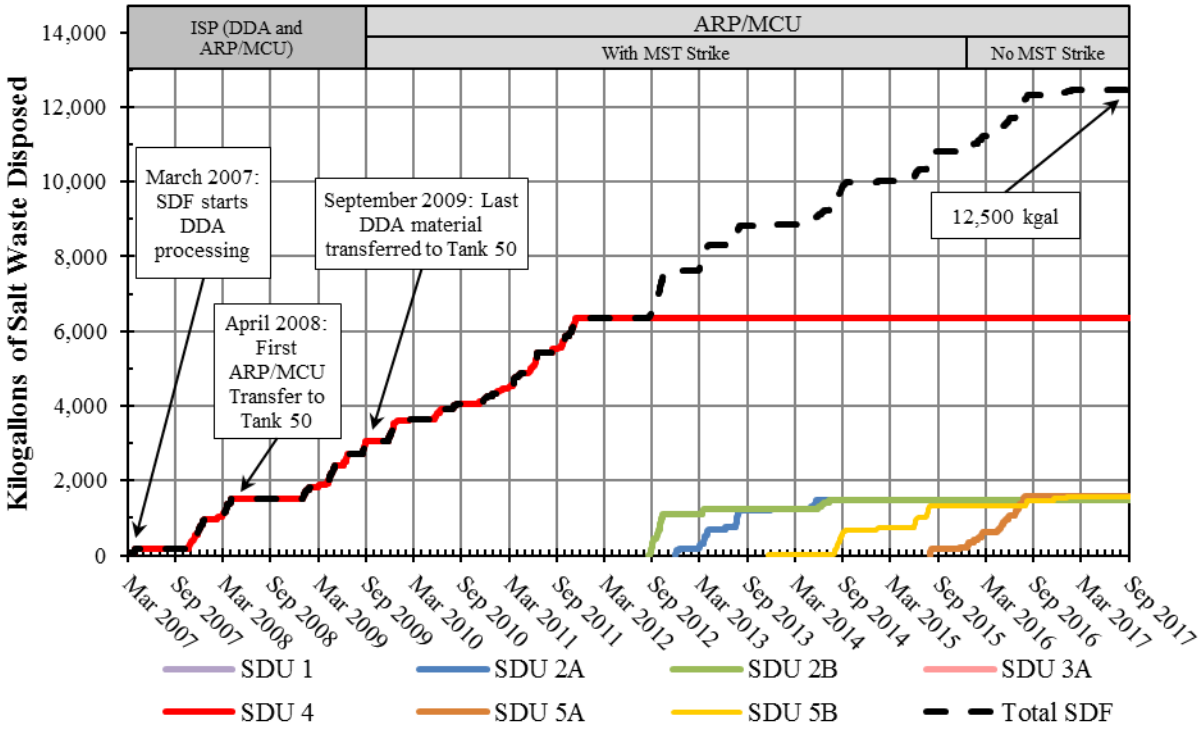


Figure 2-7: Salt Waste Disposed through FY2017 – Beginning with Start of Interim Salt Processing (DDA & ARP/MCU)



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 FY2017. 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 2-8 through 2-11 present both the current inventory and the disposed inventory for SDU 1, SDU 2, SDU 3, SDU 4, and SDU 5 from SDF start up in FY1990 through FY2017.

Figures 2-8 through 2-11 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 2-12 presents the current and disposed inventory for each SDU along with the gallons of Tank 50 material disposed in each SDU. As seen in Figure 2-12, the inventory in SDU 4 makes up the majority of both the disposed and current inventories.

Figure 2-8: SDU 1 Disposed and Current Inventories through FY2017

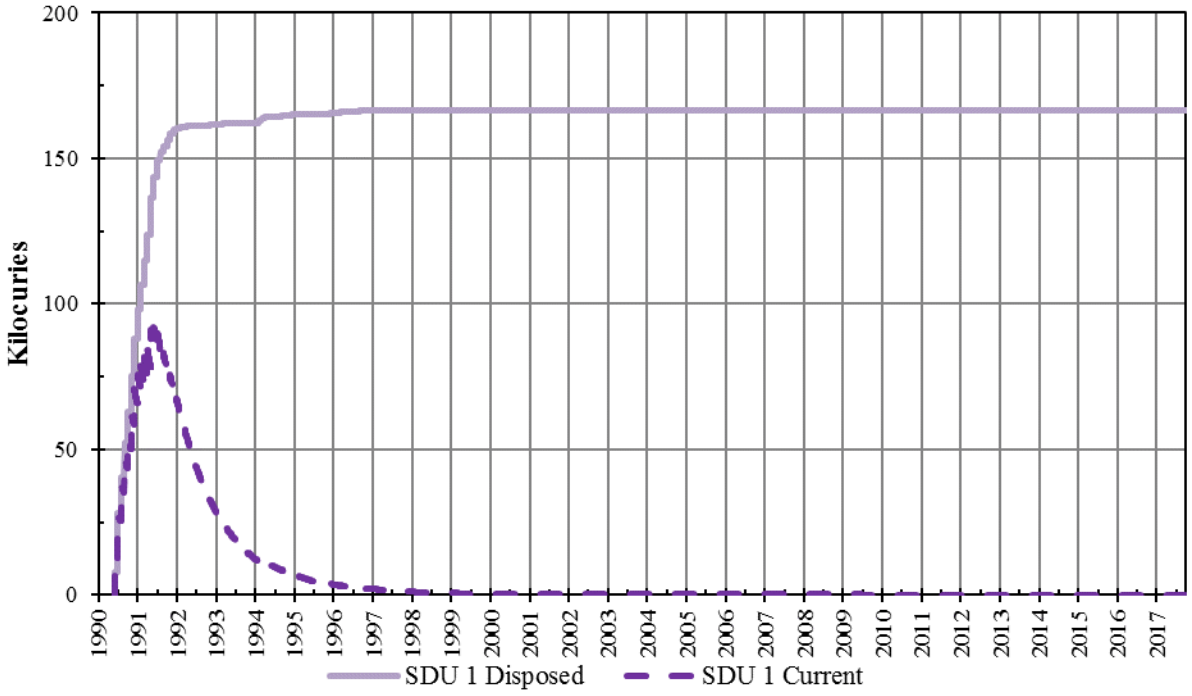


Figure 2-9: SDU 2 Disposed and Current Inventories through FY2017

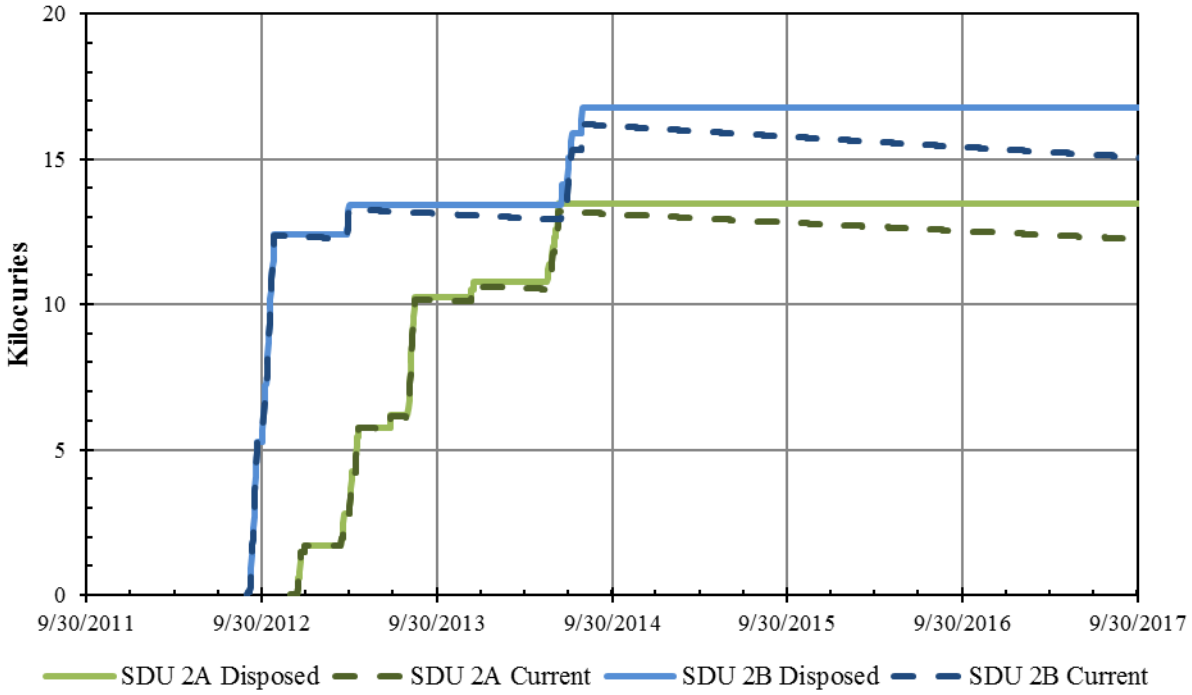
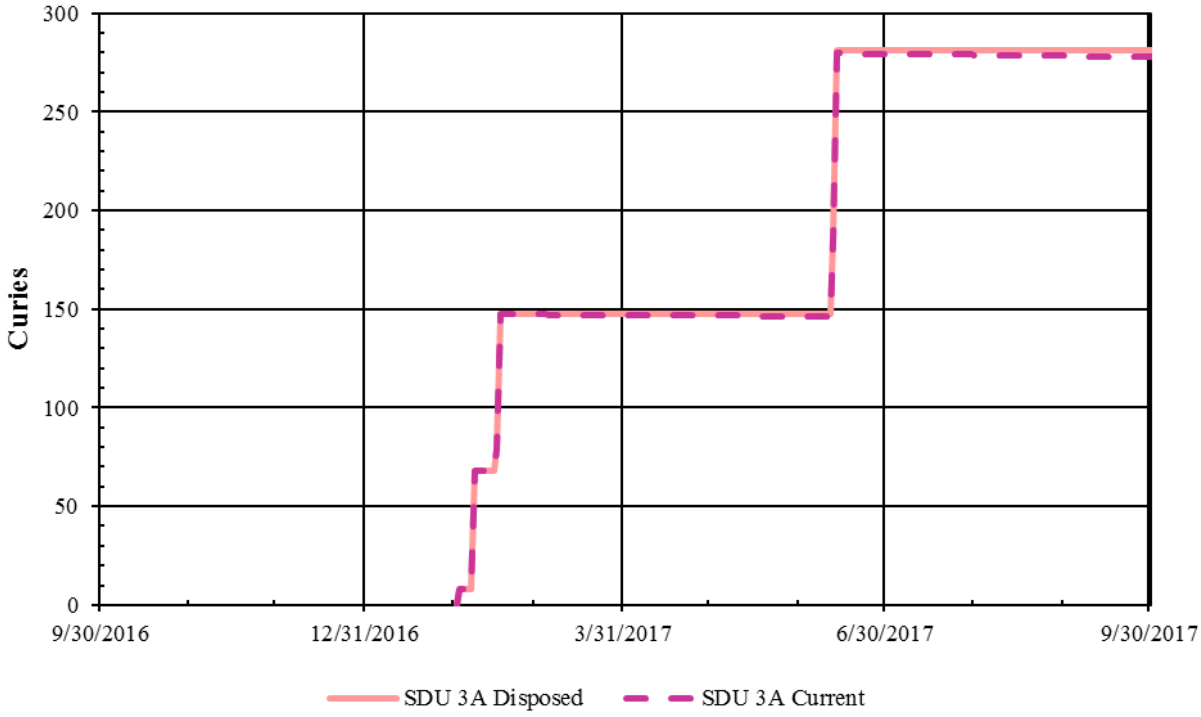


Figure 2-10: SDU 3 Disposed and Current Inventories through FY2017



Note: SDU 3B has received no saltstone grout transfers as of 9/30/2017 and is therefore not included

Figure 2-11: SDU 4 Disposed and Current Inventories through FY2017

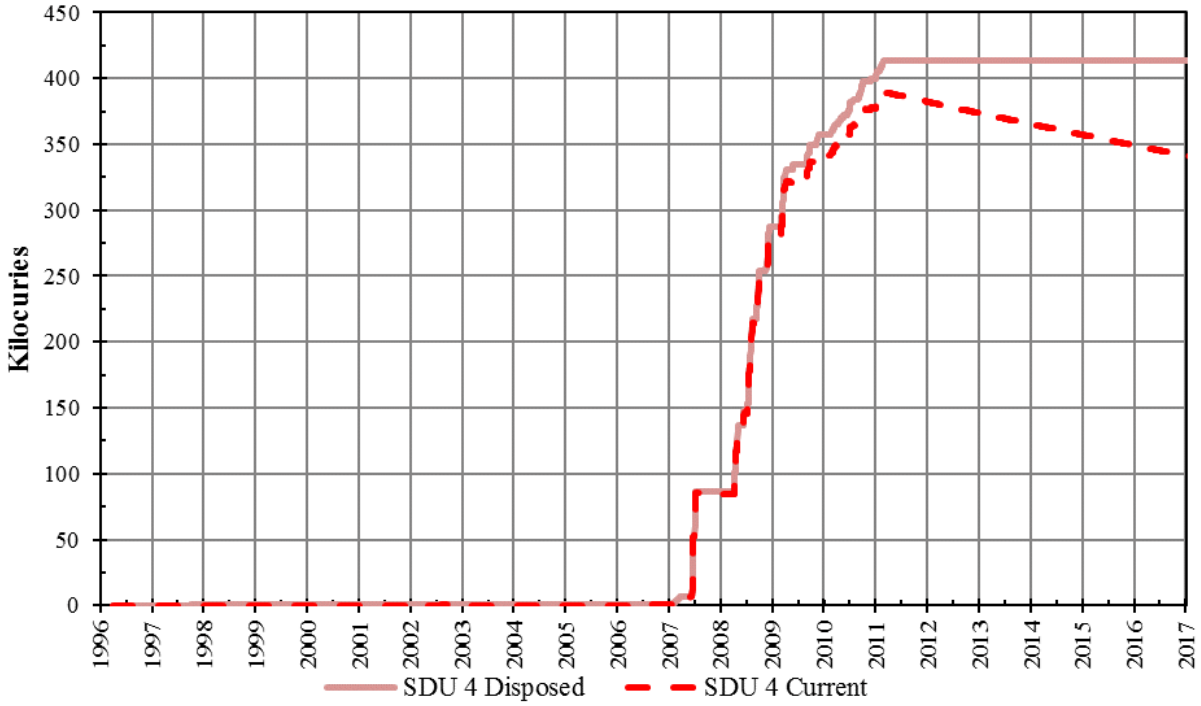


Figure 2-12: SDU 5 Disposed and Current Inventories through FY2017

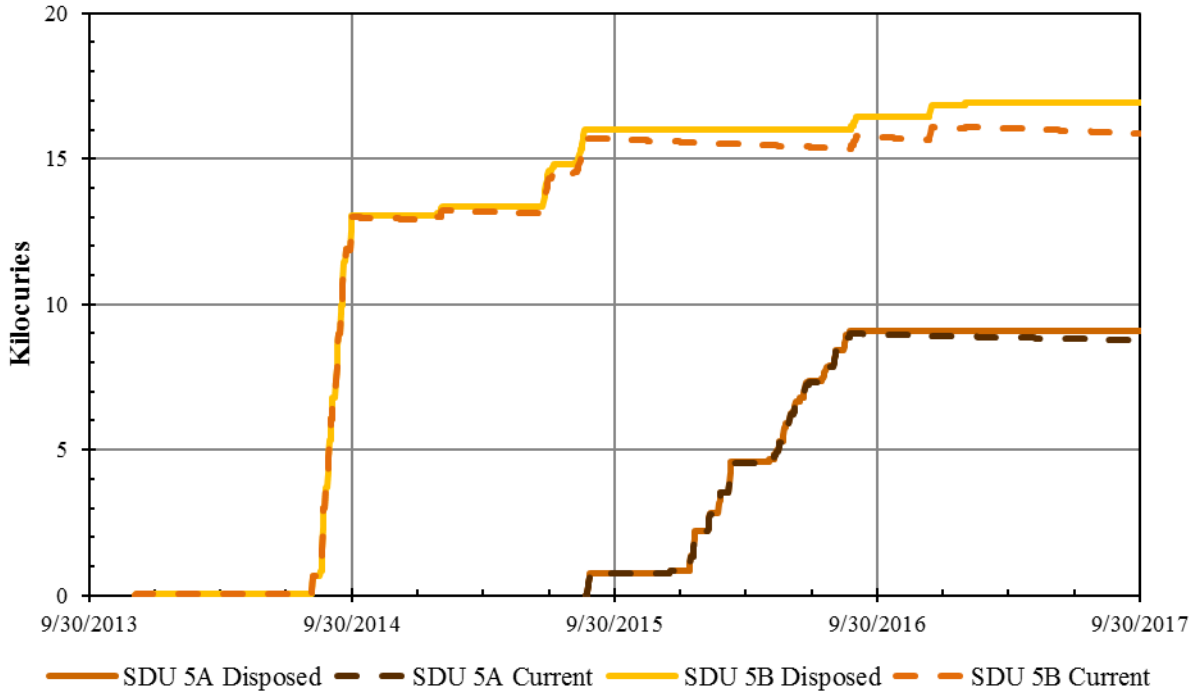
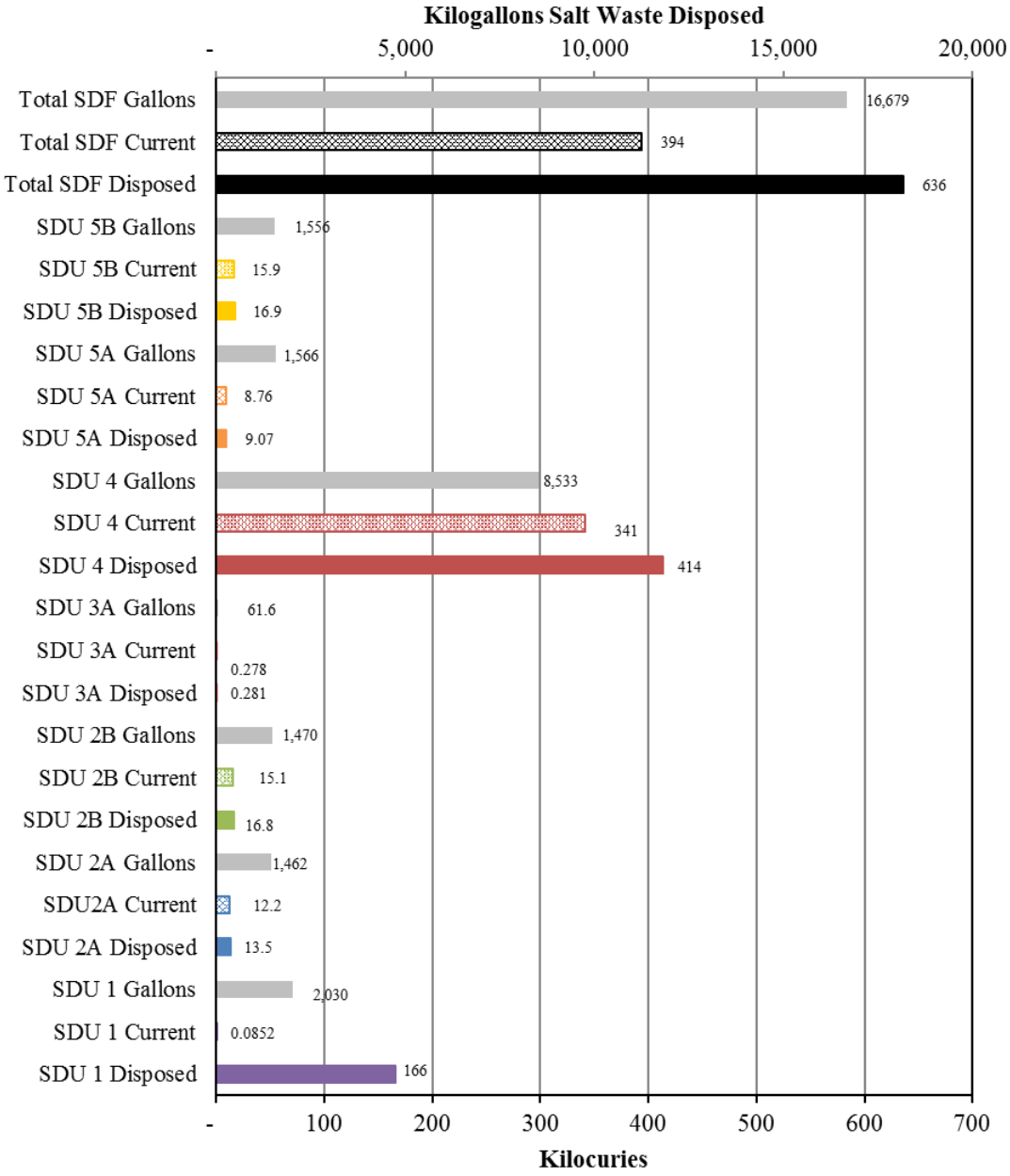


Figure 2-13: SDF Disposed/Current Inventory and Salt Waste Disposed through FY2017



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