

**Overview of Nevada Test Site Radioactive and Mixed
Waste Disposal Operations -10280**

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ABSTRACT

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office Environmental Management Program is responsible for carrying out the disposal of onsite- and offsite-generated low-level radioactive waste (LLW) at the Nevada Test Site (NTS). Core elements of this mission are ensuring that disposal takes place in a manner that is safe and cost-effective while protecting workers, the public, and the environment.

This paper focuses on an overview and impact of the new policies, processes, and opportunities taking place at the NTS related to LLW. Topics to be covered include:

- The Nevada Attorney General's Suspension Request regarding mixed low-level waste (MLLW) acceptance at the NTS
- Fiscal year 2010 direct funding changes for DOE generators NTS waste disposal operations
- Closing impacts of the original 37.2-hectare (92-acre) portion of the Area 5 Radioactive Waste Management Complex (RWMC) on the site.
- Impacts as DOE's designated Classified Disposal Facility
- Updating current waste disposal volumes, projections, and capabilities
- Impacts of the *American Recovery and Reinvestment Act* on the NTS disposal sites
- Waste volumes analysis for a New Site-Wide Environmental Impact Study
- Preparations for closing the MLLW Disposal Unit in December 2010
- New permit application for a MLLW Disposal Unit at the NTS

INTRODUCTION

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Environmental Management Program is responsible for the disposal of onsite and offsite low-level radioactive waste (LLW) and mixed low-level radioactive waste (MLLW) at the Nevada Test Site (NTS). Over the last year, the LLW Subproject experienced several changes. However, there was no impact to the primary mission of accepting and disposing DOE LLW and MLLW in a manner protective of the worker, public, and environment. This paper provides an overview of those changes and the impacts of new policies, processes, and opportunities at the NTS.

MIXED WASTE STREAM SUSPENSION

Due to a request from the Nevada Attorney General (NV AG) [1], the NTS did not process any new profiles for MLLW streams or revisions to approved MLLW profiles from August 2008 until April 2009. This request was based on the adequacy of the 1996 Site-Wide Environmental Impact Statement [2] and the NTS land withdrawal agreement in the State of Nevada v. O’Leary Settlement Agreement [3]. Environmental Management (EM)/Headquarters (HQ) requested that NNSA/NSO comply with the request until meetings with the NV AG were completed. In the third quarter of fiscal year (FY) 2009, EM/HQ completed its meetings with the NV AG, and MLLW disposal resumed [4]. The NNSA/NSO did not violate its *Resource Conservation and Recovery Act* (RCRA) MLLW disposal permit for onsite-generated MLLW; it simply agreed to comply with the NV AG’s request.

NEW SITE-WIDE ENVIRONMENTAL IMPACT STATEMENT

Early in FY 2009, NNSA/NSO, in recognition of stakeholder comments and concerns, determined it was appropriate to initiate a new Site-Wide Environmental Impact Statement (SWEIS) for the NTS and Offsite Locations in the State of Nevada. The NNSA/NSO process officially commenced its SWEIS when it published its Notice of Intent in the July 24, 2009, *Federal Register* [5]. The SWEIS will analyze the following alternatives:

- The No Action Alternative (i.e., continued implementation of the 1996 NTS Environmental Impact Statement Record of Decision and the 2000 amendment to the Record of Decision, and other *National Environmental Policy Act* decisions from 1996 to 2009)
- The Reduced Operations Alternative (i.e., an overall reduction in the level of operations and closure of specific buildings and structures)
- The Expanded Operations Alternative (i.e., an increase in missions from the No Action scenario)

For the LLW Subproject, the No Action scenario means the NTS will continue to take onsite- and offsite-generated LLW and MLLW so long as those wastes do not exceed 1 million cubic meters (m³) for the 10-year planning period. The Expanded Use scenario will consider waste streams not previously or only partially considered in the 1996 Environmental Impact Statement and/or subsequent 2002 Supplement Analysis. The reduced operations scenario will be scaled-back disposal operations at the NTS. The established baseline schedule estimates a Record of Decision published in fourth quarter of FY 2011.

DISPOSAL PLANNING FOR LOW-LEVEL AND MIXED LOW-LEVEL WASTE

DOE Manual 435.1-1, *Radioactive Waste Management Manual*, Change 1, issued July 9, 1999 [6], requires DOE sites to dispose of LLW on site if possible, dispose at another DOE disposal site, or request an exemption to dispose at a commercial disposal site. Commercial disposal facilities could be used if it is cost effective and in the best interest of the government. Sites were not required to verify the cost effectiveness of using an onsite or other DOE disposal site. On June 8, 2009, EM/HQ (EM-40) issued the “Disposal Planning for Low-Level and Mixed Low-Level Waste” memorandum, requiring EM projects to conduct a cost comparison for LLW

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disposal at DOE and commercial sites before making the final disposal decision [7]. For cost comparison purposes, a value of \$14.51 per cubic foot (ft³) was established for the NTS disposal rate. The memo directs EM sites to use the NTS as a last resort for LLW disposal. EM/HQ (EM-43) is considering incorporating this policy into DOE Order 435.1. A follow-up letter written by EM/HQ (EM-2) on August 21, 2009, requires EM projects/sites to provide monthly reports of waste volumes disposed on site, at other DOE sites, and at commercial disposal sites [8].

FISCAL YEAR 2010 FUNDING

Since FY 2008, DOE/HQ has direct-funded the NTS Disposal Operations. In FY 2008, EM/HQ funded all disposal operations. In FY 2009, each Program Office funded its own NTS disposal cost based up its 2007 disposal volumes. The funding for FY 2010 will be similar to FY 2009. Costs will be shared among the various program offices (i.e., the Office of Environmental Management [EM], the National Nuclear Security Administration [NNSA], the Office of Science [SC], and the Office of Nuclear Energy [NE]) based upon volumes received in FY2008. However, EM will fund part of its disposal operations using *American Recovery and Reinvestment Act* (ARRA) appropriated funds. Table I shows the FY 2010 funding breakdown.

Table I. DOE Program Funding Allocations for FY 2010.

Responsible Program	Amount
EM	\$4,524,373
EM ARRA	\$10,000,000
NNSA	\$6,833, 000
SC	\$244,000
NE	<u>\$503,000</u>
TOTAL	\$22,104,373

PERMANENT BURIAL

For four years, NNSA/NSO has been a part of the Classified Material Disposition Workgroup, which consists of security, classification, property, policy, and waste management personnel. Through this workgroup, the requirements for permanent burial of classified matter were included in DOE Manual 470.4-4A, *Information Security Manual*, issued January 16, 2009 [9]. The NNSA/NSO Security Manager approved the NTS Area 5 Radioactive Waste Management Complex (RWMC) for permanent burial in May 2009. Sites must meet the requirements of the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) [10] and DOE M 470.4-4A [11] to permanently bury classified matter at the NTS.

AMERICAN RECOVERY AND REINVESTMENT ACT

The ARRA will greatly influence 2010 LLW disposal volumes, projections, and capabilities. The 2010 LLW/MLLW forecast is 47,289 m³ (1.67 million ft³). Approximately 58 percent is ARRA funded. Because of the strict reporting requirements associated with ARRA funds, NNSA/NSO and its Management and Operations (M&O) Contractor, Nuclear Securities Technologies, LLC (NSTec), agreed to keep separate disposal records for ARRA-funded LLW and MLLW. Additionally, NNSA/NSO incentivized the M&O Contractor to maintain the

capability of safely disposing of 2 million ft³ (not to exceed 4,729 m³ per month [167,000 ft³ per month]) of waste that does not require special handling or services (e.g., crane operations, overtime). The NNSA/NSO LLW forecasts are updated quarterly; however, generators may increase their forecasts at any time. If the forecast approaches the monthly limit, the M&O works closely with the sites to level-load shipments and package wastes in the least labor intensive packaging as possible. These measures help sites ship their LLW disposal volumes to the NTS without incurring extra service fees.

92-ACRE AREA CLOSURE

The NTS Area 5 RWMC covers approximately 299.5 hectares (740 acres) with the southeast and northeast quadrants actively used to dispose radioactive waste. Most of the disposal cells in the southeast quadrant (known as the “92-Acre Area”) are operationally closed or nearing capacity. The northeast quadrant (known as the “Expansion Area”) has active cells and room for future development (Figure 1). The NNSA/NSO is planning to close the 92-Acre Area in 2011. Closure requires meeting a wide range of regulatory requirements for the numerous waste types and disposal configurations. Table 2 shows for the regulatory requirements for each cell.

The 92-Acre Area contains 25 shallow excavated pits and trenches and 13 Greater Confinement Disposal (GCD) boreholes. The pits and trenches (hereafter referred to as “cells”) range in depth from 4.6 to 14.6 meters (m) (15 to 48 feet [ft]). A small quantity of classified transuranic (TRU) waste was inadvertently buried in one cell in 1986. The GCD boreholes are intermediate-depth disposal units, 3.0 to 3.7 m (10 to 12 ft) in diameter and about 36.0 m (120 ft) deep. The GCD boreholes include high-specific-activity, low-level, TRU, and mixed TRU (MTRU) wastes. One other cell (the permitted MLLW Disposal Unit) remains active within the 92-Acre Area but is expected to be operationally closed on or before November 30, 2010. The rest of the cells are operationally covered with native soil approximately 2.4 m (8 ft) thick.

The NNSA/NSO worked closely with the Nevada Division of Environmental Protection (NDEP) and DOE/HQ to use a three-step closure process, similar to those used under the *Federal Facility Agreement and Consent Order* (FFACO) [11]. The last step before closure, the Corrective Action Decision Document (CADD)/Corrective Action Plan (CAP), was approved by NDEP on August 19, 2009 [12].

The closure cap will be three, 3-m-thick monolayers of native alluvium with rip-rap placed to prevent weathering. During the active institutional control/closure period, NNSA/NSO will fill any subsidence with native alluvium. Drainage areas around the cap will control runoff/run-on. The post-closure monitoring period will be start in 2012 and continue to 2041. After that, no environmental monitoring will take place. The estimated cost of the closure is \$10 million. Currently, the estimate is going through an independent cost estimate review (ICER). Once the ICER is complete, NNSA/NSO will incorporate any ICER recommendations into the estimate and add the closure cost to the baseline.

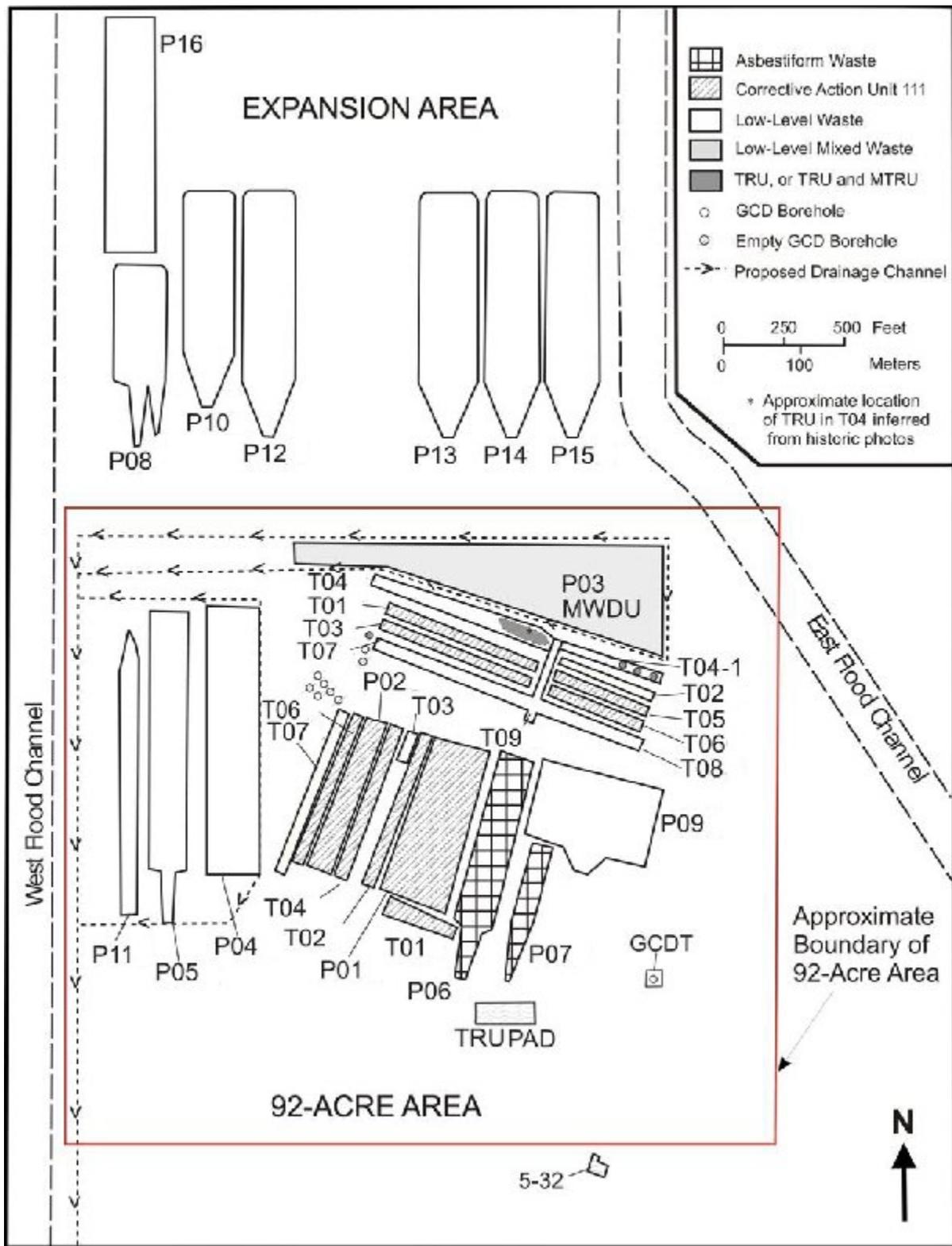


Fig. 1: The NTS Area 5 RWMC showing the boundary of the 92-Acre Area and Expansion Area.

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Table II. Regulatory Regimes for the 92-Acre Area.

CLOSURE UNIT	WASTE UNIT	STATUS OF OPERATION	WASTE TYPE	CLOSURE REGULATIONS	APPROVAL AUTHORITY
LLW Unit	P09	Operationally Closed	LLW	DOE O 435.1 [13]	NNSA/NSO
	T03	Operationally Closed			
	T04-1	Operationally Closed			
	T02	Operationally Closed			
	T07	Operationally Closed			
	T08	Operationally Closed			
	T09	Operationally Closed			
	GCDT	Operationally Closed			
	GCD-05	Operationally Closed			
	GCD-06	Open, full			
	GCD-07	Open, full			
	GCD-08	Open, empty			
	GCD-09	Open, empty			
	GCD-10	Operationally Closed			
	GCD-11	Open, empty			
	GCD-12	Open, empty			
	P04	Operationally Closed			
P05	Operationally Closed				
P11	Operationally Closed				
CAU 111 Unit	P01	Operationally Closed	MLLW	FFACO [11], RCRA Part B Permit [13], 40 CFR 265.310 [15]	NDEP
	P02	Operationally Closed			
	T01	Operationally Closed			
	T02	Operationally Closed			
	T04	Operationally Closed			
	T06	Operationally Closed			
	T07	Operationally Closed			
	T01	Operationally Closed			
	T03	Operationally Closed			
	T05	Operationally Closed			
	T06	Operationally Closed			
Regulated Asbestos	P06	Active	LLW with regulated asbestos	NV Solid Waste Disposal Permit [15]	NDEP
	P07	Operationally Closed			
Pit 3 MLLW Disposal Unit	P03	Active	MLLW	RCRA Part B Permit [13]	NDEP
TRU GCD Borehole Unit	GCD-01	Operationally Closed	TRU, MTRU	40 CFR 191 [17], 40 CFR 265.310 [15]	DOE/HQ (TRU Federal Review Group)
	GCD-02		TRU, MTRU		
	GCD-03		TRU, MTRU		
	GCD-04		LLW, MLLW, TRU, MTRU		
TRU Trench Unit	T04	Operationally Closed	LLW, TRU, MTRU	40 CFR 191 [17], 40 CFR 265.310 [15]	DOE/HQ (TRU Federal Review Group)

PERMIT APPLICATION FOR A NEW MIXED LOW-LEVEL RADIOACTIVE WASTE DISPOSAL CELL AT THE NTS

The current MLLW disposal cell, Pit 3, is due to close in December 2010 under the terms of the RCRA permit [14]. If the NTS does not apply for a new RCRA-permitted MLLW disposal facility, there would be no DOE waste management facility permitted to dispose of offsite-generated MLLW after 2010. This jeopardizes DOE's environmental cleanup mission and other mission-related activities that generate MLLW. To meet DOE's MLLW needs, NNSA/NSO plans to continue MLLW disposal capability at the NTS by applying for a new MLLW disposal permit application.

The new MLLW facility will be fully compliant with RCRA and DOE Order 435.1, *Radioactive Waste Management* [6]. The cell will be in the Area 5 RWMC with a design capacity of 25,485 m³ (33,000 cubic yards), with trench base dimensions of 46 m by 91 m (150 ft by 300 ft) and a depth of approximately 6 m (20 ft) below ground surface. The cell should have the capacity to dispose of MLLW for 15 to 20 years. The NNSA/NSO submitted the RCRA permit application to NDEP on September 29, 2009 [19]. It may receive conditional approval in early FY 2010. Upon conditional permit approval, a contract to deliver design/build services for the cell will be awarded. The condition will be lifted after NDEP approval of the final design. Once the NDEP permit approval is received, construction will begin. Construction, quality assurance, and certification activities are to be completed late in 2010 or early 2011.

NTS DISPOSAL ELIGIBILITY REQUIREMENTS

With the closing of LLW disposal at Barnwell to non-Compact states, NNSA/NSO is constantly receiving requests from new generators to dispose of their wastes. The NNSA/NSO can only dispose of LLW caused by DOE activities. To ensure this, NNSA/NSO developed a comprehensive eligibility determination process for new generators requesting LLW/MLLW disposal at the NTS. This process is applicable to facilities not owned and/or operated by DOE or its direct contractors – including projects involving other federal agencies, their direct contractors, or private organizations.

The generator is required to submit relevant background and waste stream information to NNSA/NSO for evaluation. This evaluation identifies whether a DOE waste nexus exists; a checklist documents the evaluation and information supporting the nexus. The evaluation also requires concurrence from the NNSA/NSO legal counsel.

If the eligibility determination is favorable, NNSA/NSO forwards a recommendation to NNSA/HQ (NA-56) for approval. The NA-56 usually requests EM/HQ (EM-43 formerly EM-12) to review and concur before NA-56 grants approval. The generator is advised that NTS disposal is authorized but is subject to meeting all applicable requirements of the NTSWAC [10]. This system of evaluation ensures that proper decisions and nexus connections are documented.

FUTURE WASTE MANAGEMENT INITIATIVES

The primary ongoing Waste Management Program activity is providing LLW and MLLW disposal capacity as a Regional Disposal Site in support of DOE environmental cleanup programs. The NTS and Hanford sites are the current designated DOE Regional Disposal Facilities for LLW and MLLW. However, due to ongoing litigation, the Hanford site is enjoined from accepting offsite wastes, with the exception of certain wastes from DOE Naval Reactors programs.

Out-year forecast data provided by current approved NTS generators indicate that the NTS will continue to receive volumes of waste through FY 2027. Existing waste management facilities and activities are expected to continue over the next 10 years. The NTS will continue to be a Regional Disposal Facility for LLW and MLLW generated throughout the DOE Complex. Current disposal operations will continue, as will other management operations such as temporary waste storage and confirmatory waste examination. Additional information on potential new LLW and MLLW management activities and waste streams is provided below.

Treatment of MLLW

The NTS performs limited “treatment by generator” on selected MLLW that resulted from the repackaging and processing of legacy TRU MLLW and NTS newly generated MLLW. Future plans are to obtain a RCRA permit for both the storage and treatment of MLLW at the Area 5 RWMC allowing receipt of offsite MLLW and ultimate treatment and disposal.

A real-time radiography unit is used for nondestructive examination (verification) of selected LLW and MLLW. Within the Waste Examination Facility, minor modifications were made to the Visual Examination and Repackaging Building to support repackaging of TRU MLLW for offsite shipment. This activity has been completed, and this facility is being evaluated for future use on similar projects that require higher levels of containment.

Potential future waste management facilities and activities

Treatment of RCRA or Toxic Substances Control Act Wastes: With the exception of wastes treated at the Area 11 Explosive Ordnance Disposal Unit and selected onsite-generated MLLW, NNSA/NSO is not permitted to treat RCRA waste from offsite waste generators. The NNSA/NSO is considering submitting a revised RCRA Part B permit application for the storage and treatment of offsite-generated MLLW.

Disposal of Greater-Than-Class-C (GTCC) Low-Level Radioactive Waste: The DOE/HQ is preparing a GTCC Environmental Impact Statement to address disposal of GTCC LLW. The NTS is being considered as one of eight candidate DOE sites for disposal of such waste, along with generic commercial disposal facility options in arid and humid environments. The disposal facility selection will not occur before 2012.

Transloading of Waste Shipments to the NTS: To provide NTS-approved generators with additional cost-effective waste transportation options, NTS staff has encouraged the establishment of rail-to-truck transloading alternatives. All transloading options involve offloading outside the State of Nevada. In addition, NNSA/NSO encourages generators and their

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transporters to review route selections and requires that shipments avoid Hoover Dam and the Las Vegas metropolitan area.

Transuranic and Mixed Transuranic Wastes: The NTS has resolved all legacy TRU and MTRU waste at NTS by repackaging, characterizing, and shipping the stored waste to the Waste Isolation Pilot Plant (WIPP) or Idaho National Laboratory (INL). The NNSA/NSO research operations on the Joint Actinide Shock Physics Experimental Research (JASPER) Project annually result in about 23 m³ (810 ft³) of newly generated TRU waste that will also be sent offsite for disposition.

Future waste streams

The NTS-approved generators provide annual forecasts of LLW and MLLW that are planned for NTS disposal. Other potential LLW and MLLW streams have been identified that are not forecasted at this time but may be considered for NTS disposal. The actual generation of these waste streams is uncertain, and there may be options for their disposition at locations other than the NTS. These waste streams are listed below; however, this is not an inclusive list as new waste streams may be identified in the future:

- U.S. Department of Defense and DOE strontium-90 radioisotope thermoelectric generators recovered from field sites throughout the world
- Depleted uranium waste generated at the planned Portsmouth and Paducah depleted uranium hexafluoride (DUF6) conversion facilities
- U.S. Department of Defense cleanup of facilities or sites containing depleted uranium armor, projectiles, or targets
- Site cleanups at former Manhattan Project and supporting facilities
- Former research reactor site cleanups at facilities where fuel was supplied by the Atomic Energy Commission (AEC) or successor agencies
- Disposition of uranium-233 waste from site cleanup at Oak Ridge National Laboratory
- DOE Naval Reactors Program waste resulting from naval vessel decommissioning
- Waste from environmental restoration projects at Los Alamos National Laboratory
- Large vitrification process components from West Valley determined to be Waste Incidental to Reprocessing
- Wastes containing enriched uranium from historical Nuclear Engine for Rocket Vehicle Application (NERVA) (AEC-NASA) nuclear rocket engine project support sites
- Transuranic wastes not acceptable for disposal at the WIPP
- Decontamination & decommissioning (D&D) wastes from former DOE gaseous diffusion plants in Oak Ridge, Portsmouth, and Paducah
- LLW generated by U.S. commercial uranium enrichment projects – per requirements in Title 42 *United States Code* Section 2297h-11
- Classified legacy TRU waste currently stored at the NTS that is not shippable to WIPP due to fissile content limits on WIPP transport containers
- DOE reactor baseplates irradiated in Tennessee Valley Authority or other commercial nuclear facilities
- Reactor pressure vessel from the D&D of the former NS Savannah nuclear-powered ship

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- Wastes covered by DOE memorandums of understanding with private firms performing cleanups at commercial sites
- Sealed sources and other high-risk radiological items recovered by the DOE Global Threat Reduction Initiative through the Los Alamos Offsite Source Recovery Program
- Wastes resulting from the down-blending of highly-enriched uranium by DOE contractors
- Irradiated concrete shield blocks from DOE Science research project sites

CONCLUSION

The NNSA/NSO strives to meet the needs of the DOE Complex for LLW and MLLW disposal. Along with NNSA/NSO, NSTec, EM/HQ, and NDEP, the approval process and disposal operations continue to be refined and made more efficient, without losing the mission of providing safe disposal in a manner that protects the co-worker, the public, and the environment.

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