

**Overview of Low-Level Waste Disposal  
Operations at the Nevada Test Site**

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**ABSTRACT**

The U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office Environmental Management Program is charged with the responsibility to carry out the disposal of on-site and off-site generated low-level radioactive waste at the Nevada Test Site. Core elements of this mission are ensuring that disposal take place in a manner that is safe and cost-effective while protecting workers, the public, and the environment.

This paper focuses on giving an overview of the Nevada Test Site facilities regarding current design of disposal. In addition, technical attributes of the facilities established through the site characterization process will be further described. An update on current waste disposal volumes and capabilities will also be provided. This discussion leads to anticipated volume projections and disposal site requirements as the Nevada Test Site disposal operations look towards the future.

**INTRODUCTION**

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office Environmental Management Program is responsible for the disposal of onsite and offsite low-level radioactive waste (LLW) at the Nevada Test Site (NTS). A core mission is to ensure disposal operations are safe, cost-effective, and protective of workers, the public, and the environment.

Over the last year, the LLW Sub-Project experienced several changes. However, no changes impacted the primary mission of accepting and disposing DOE LLW in a manner protective of the worker, public, and environment. This overview discusses current disposal operations, new waste acceptance criteria, forecast updates, and new and exciting capabilities at the NTS.

### **Management and Operations Contractor Change**

The most significant change this year regarding LLW disposal at the NTS has been the transition to a new Management and Operations (M&O) contractor, Nuclear Security Technologies, LLC (NSTec). The fresh and energetic NSTec leadership has proposed new ideas and approaches to acceptance and disposal operations. Not dissuaded by raised eyebrows or “We tried that years ago, it didn’t work” statements, NSTec has opened new opportunities for the NTS generator community.

NSTec reviewed the fiscal year (FY) 2007 LLW shipment forecast histogram and noticed that generators schedule the majority of LLW volumes in the last quarter of the FY. NSTec reasoned the scheduling was due to the FY 2007 continuing resolution (CR) and that the generator community was waiting until the latter half of the FY to fund LLW shipments to the NTS. Because the NTS had sufficient generator fee funds to cover expenses for the first quarter, NSTec asked the generators to accelerate forecasted LLW shipments from the last quarter to the first or second of the FY if possible. They asked that the generators pay the disposal fees during the CR as funds became available. Thus, generators can ship LLW early and pay for disposal later in the FY.

NSTec has promised to raise the capability of one disposal crew from 33,980 cubic meters ( $m^3$ ) (1.2 million cubic feet [ $ft^3$ ]) per year to 42,475  $m^3$  (1.5 million  $ft^3$ ) (a 20% increase in productivity). This increase will effectively lower the disposal unit cost from \$466.43 to \$375.00 per  $m^3$  (\$13.06 to \$10.50 per  $ft^3$ ).

### **New Operations Strategy for the Area 3 and 5 Radioactive Waste Management Sites (RWMS)**

The LLW sub-project stopped disposing LLW in the Area 3 RWMS in July 2006. This action had been considered since FY 2004 when it was projected that the disposal cells would be filled to capacity. However, the NTS did not receive the forecasted waste amount that was slated for disposal in Area 3 and capacity was not reached. The revised projections indicated that it would take three to five years to fill the cell to capacity. Cost analysis indicated it was too expensive to operate the facility for that time period. Therefore, the sub-project placed the facility in inactive status, until sufficient waste volumes warrant the reopening. If future waste volumes do not require the reopening of this facility, the NTS will perform a cost analysis to determine if the facility should be permanently closed.

The Area 5 RWMS currently receives all LLW, mixed LLW (MLLW), and classified materials. To meet this demand, the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NSO), the federal landlord of the Nevada Test Site, plans to build a single, larger cell to dispose LLW and classified materials. NSTec estimates to have this disposal unit completed by early FY 2008.

Beginning as early as this fiscal year, the sub-project plans to improve the operational closure cap run-on and run-off capabilities of the disposal units located in the original

“92-acre” site (Figure 1) of the Area 5 RWMS. This activity, if approved by the State of Nevada, will consist of placing native alluvium soil in the spaces between and above the disposal units, creating a uniform 2.4 m (8 foot) mono-layer cap [1].



Figure 1. Area 5 Radioactive Waste Management Site with “92-acre” site outlined

The “92-acre” closure will be conducted in FY 2011 when the Mixed Waste Disposal Unit (MWDU) will enter into its closure period. The sub-project continues to have discussions with State of Nevada regulators on the planned improvements.

### **Improvements to the Nevada Test Site Waste Acceptance Criteria (NTSWAC)**

In November 2006, the sub-project revised the NTSWAC based on lessons learned and process improvements. The more important changes include: changes to the Polychlorinated Biphenyl (PCB) acceptance criteria; lessening of audit requirements; deletion of notification requirements; a regulatory clarification from the State regulator; and verification process changes. [2]

*PCB Acceptance Criteria:* The NTSWAC was revised allowing the acceptance of PCB's in the MWDU. The original NTSWAC did not recognize the PCB waste forms permitted in hazardous waste landfills.

*Biennial Audits:* The biennial audits of approved generators were replaced with shorter, more focused surveillances. The surveillances will be more frequent but require less of the generator's resources to conduct.

*Monthly Shipping Notification:* The requirement for a monthly shipping notification was deleted. NSTec determined that the schedule was not necessary for efficient operations.

*Regulatory Clarification:* The NSO is required to physically visit MLLW generator sites as they package MLLW for shipment to the NTS. During this time, known as an off-site waste verification visit, a generator expressed concern regarding settling of compactable

waste during transportation. The regulator, the State of Nevada Division of Environmental Protection (NDEP), the NSO Radioactive Waste Acceptance Program (RWAP), and the generator discussed the possibility that the waste would not meet the 40 CFR 265.315 requirement of being at least 90 percent full when placed in the MWDU. NDEP, recognizing that this could be an on-going problem for NTS, researched the requirement which is based on subsidence avoidance and closure cap integrity. Taking into consideration the NTS strength requirement, NDEP developed a regulatory clarification. [3] This clarification sets requirements for generators which allow NDEP to accept waste packages less than 90 percent full but ensures the intent of the regulation is met. This clarification was incorporated into the NTSWAC and posted on the RWAP web page ([www.nv.doe.gov/emprograms/environment/wastemanagement/rwap.aspx](http://www.nv.doe.gov/emprograms/environment/wastemanagement/rwap.aspx)).

*Visual Verification:* Incorporating the acceptance of recorded media (e.g., pictures, videos, etc.) depicting waste being generated or treated was added to the NTSWAC verification process. Media showing the process from start to finish, including the set-up, placement of waste, solidification, and completion of the waste packaging can be used in lieu of RWAP personnel visually verifying the waste.

*Classified Material Delivery:* In the past, all waste shipments had to arrive at the NTS during normal working hours. If the LLW/MLLW shipment arrived early, the NTS security would require the driver to leave the NTS and return during working hours. However, the NTS security will now allow classified low-level material shipments to arrive at the NTS during nonworking hours; provided the driver stays with the shipment.

The sub-project is considering additional changes to the NTSWAC to improve disposal operations. These changes include: 1) Eliminating the container strength requirement of 2.37E06 kg per square meter (3,375 pounds per square inch). The costs, benefits, and safety of stacking techniques are being reviewed to determine if the requirement is needed. If eliminated, the generator community would benefit economically without negatively impacting the workers or the environment. 2) Reduce the lifting strength factor for crane operations from a 5:1 ratio to the industry standard of 3:1.

## **Transportation**

The NTSWAC encourages generators to avoid transporting shipments through the Las Vegas Metropolitan area, including the Las Vegas Beltway (I-215) and the Reno Metropolitan area. Additionally, Hoover Dam has been closed to truck traffic since September 11, 2001; therefore, generators must take alternative routes. Shipments should be scheduled to arrive during normal business hours, as parking problems can result if trucks arrive prior to disposal operations staff.

## **Assistance**

Technical support and assistance is available through the sub-project, free of charge. The sub-project is aware that the NTSWAC is a complex set of requirements. Therefore, sub-project personnel are available to assist the generators with waste profiling questions and

NTSWAC compliance issues. Site visits, at the generator request, can be scheduled to assist its generators in complying with the NTSWAC. These visits are not audits or surveillances and no corrective action requests are issued. The visit is a consulting service to help the generators develop a cost effective compliant program.

### **Modeling for the Area 3 and 5 RWMS Performance Assessments**

In November FY 2006, the LLW Federal Review Group (LFRG) reviewed the NTS Area 5 RWMS Performance Assessment (PA) Model for compliance with DOE Order 435.1 “Radioactive Waste Management” [4]. The LFRG recommended, without conditions, the approval of the PA which confirms that the NSO meets DOE Order 435.1. The fully probabilistic model allows PA personnel to rapidly and thoroughly review a waste stream’s suitability for disposal at the NTS.

In the past, when a generator proposed a new LLW stream for disposal that had radiological challenges, the PA review could take up to a year to determine if the waste was suitable for disposal at the NTS. Not only was the former process slow, but it was also expensive. Therefore, the review was only conducted on newly proposed waste streams that were large in volume and/or high in radioactivity. With the probabilistic model, the process now takes only days. In fact, every waste stream profiled by generators is reviewed by PA personnel using the model. This gives the sub-project real-time knowledge of the NTS’ compliance with the performance objectives of DOE Order 435.1

### **LLW and MLLW Forecasts**

The current forecasts for FY 2007 through FY 2012 (Figure 2) indicate LLW/MLLW volumes are declining. However, the need for LLW/MLLW disposal still exists. For example, in FY 2008, the NTS may be the only federal facility to dispose higher activity LLW and MLLW. The NTS is working with the generators to meet the future disposal needs of the DOE complex.

Even though the Area 3 RWMS is in an inactive status, there is the possibility that as early as FY 2008 a LLW disposal campaign will require its re-opening. If this campaign comes to fruition, not only would the remaining disposal capacity of the inactive unit be filled, but another unused unit may also be necessary.

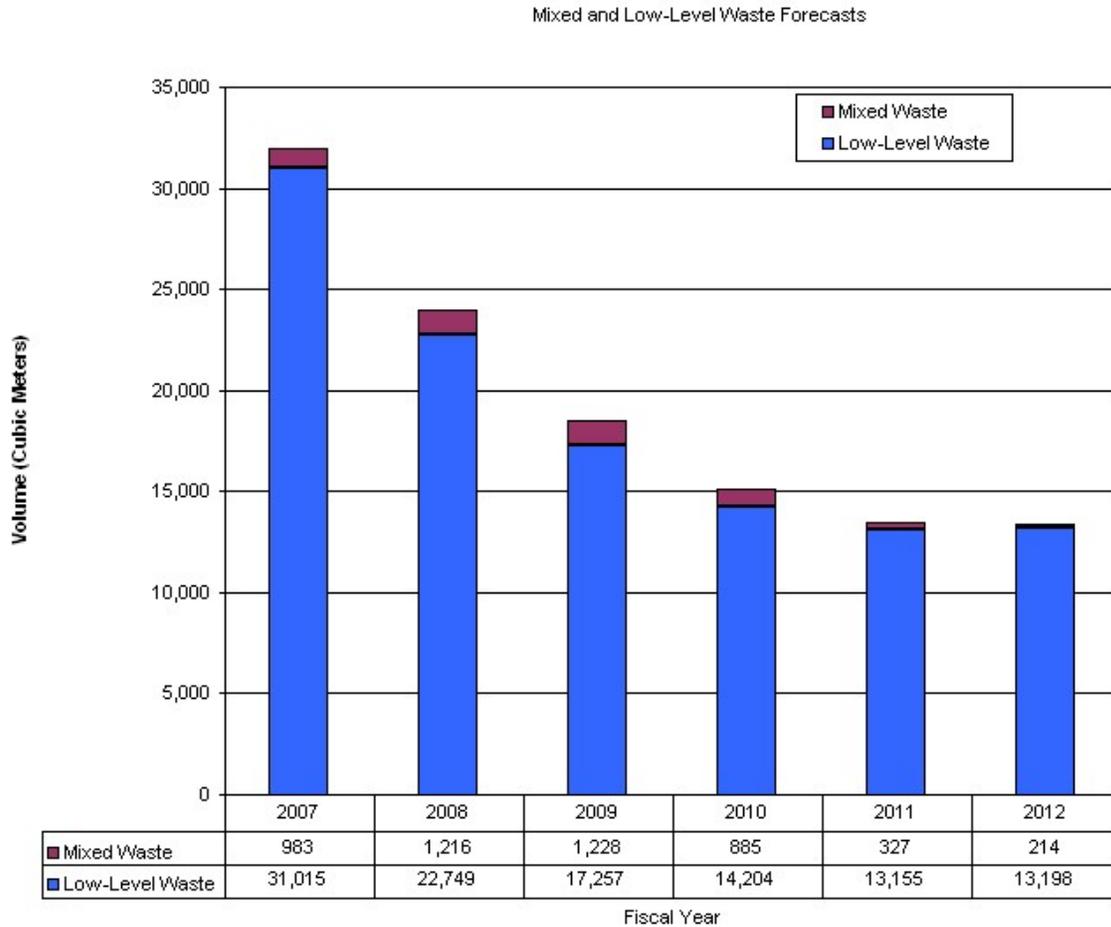


Figure 2. Mixed and low-level waste forecasts through fiscal year 2012.

### New Funding Mechanism for LLW/MLLW disposal

The current chargeback funding mechanism (in which the generator forecasts their LLW disposal volume, the Project allocates resources for disposal of that volume, and the generators pay the cost of the allocated resources) has drawbacks when waste forecasts decline. In other words, when the disposal volumes are high, the unit cost is low even though the fixed costs of disposal are unchanged. However, when volumes decline, the fixed cost becomes a large part of the unit cost. Predictably, as volumes decline, the unit cost increases. Generators tend to further lower their forecasted volumes when disposal costs increase, thus raising the unit cost. Soon a downward spiraling trend develops. If the trend continued, the sub-project would close the disposal operations and DOE would not have a major disposal path option for its LLW/MLLW.

To prevent closure, DOE Headquarters will direct fund one disposal crew (capable of disposing 42,475 m<sup>3</sup> (1.5 million ft<sup>3</sup>) at the NTS starting in FY 2008. Generators will still forecast volumes, but Headquarters will transfer the needed funds from the generators to the sub-project. [5]

## **New RCRA Part B Permit**

On December 1, 2005, the NTS received its renewed RCRA Part B permit from the NDEP [6]. The renewed permit lifted an off-site generated MLLW disposal prohibition. However, the authorization to receive MLLW is restricted to 20,000 m<sup>3</sup> (706,300 ft<sup>3</sup>) or five years, whichever comes first. Once one of the milestones is reached, the MWDU will close. If needed, the sub-project could seek to permit a new MWDU in compliance with Title 40 CFR 264. Currently, there is no plan to permit a new MWDU.

As of November 2006, almost 20% of the operational time frame has passed and less than 1% of the MWDU capacity has been used. To identify actions to increase the use of the MWDU, HQ and the NTS organized a MLLW Summit. Summit attendees were the key decision-makers for the DOE, EM, and NNSA sites. Commercial LLW treatment and disposal sites also attended.

At the conclusion of the meeting, even though actions were identified to increase disposal volume projections for the MWDU, it was determined that the DOE complex will not fully use the disposal capacity by the December 1, 2010 closure date. This is due to the fact that during negotiations of this sensitive topic between DOE and NDEP there were limited discussions with non-NSO entities regarding the possibility of lifting the MLLW disposal prohibition until the public comment period was announced. As a result, MLLW generators were not able to plan accordingly to meet the five-year deadline. The Summit attendees also concluded that the DOE complex will still need a MLLW disposal location. The generators will need to send MLLW to Hanford or a commercial facility. Although both options may be available in the future, currently, there is no current disposal pathway for some of DOE MLLW after 2010.

## **Future Needs**

Currently, the NTS accepts low-level classified material without hazardous constituents for indefinite storage. This material, located in the Area 5 RWMS, remains retrievable because it has a potential future use. Generators have requested to indefinitely store classified material with hazardous constituents in the MWDU. However, the MWDU is for the disposal of waste not the storage of material. Classified material is not considered waste until it is sanitized, demilitarized, or declassified. Since classified material must be retrievable, and the MWDU will be closed in accordance with the RCRA closure plan, a closure cap would not be a viable option for classified material with hazardous constituents. Possible alternate plans are being considered, but are dependent upon agreement between NTS, DOE, NNSA, and Nevada Site Office security agencies.

## **CONCLUSION**

The changes to the operations and procedures regarding waste disposal at the NTS have greatly benefited the generator community. The NTS has the disposal capacity to meet DOE LLW needs. The NTS will be able to meet the complex' MLLW disposal needs

until December 1, 2010. However, after that date, the complex will need to seek MLLW disposal options at other federal or commercial MLLW disposal facilities. To further meet DOE's disposal needs, the NTS is willing to send its NTSWAC Subject Matter Experts to consult with the generators to develop or modify cost effective NTSWAC compliant programs. As the NTS meets the DOE's LLW and MLLW disposal demands, funding method changes will help ensure availability for the long-term needs of the complex.

## REFERENCES

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