Industrial Sites
CAU 547
Closure Scenario

Industrial Sites Committee

January 12, 2011

Corrective Action Unit (CAU) 547

- Background
  - CAU 547 is comprised of three Correction Action Sites (CAS)
    - 09-99-06 Player
    - 02-37-02 Mullet
    - 03-99-19 Bernalillo
  - The primary component of each of CAS is piping that contains plutonium (Pu)
  - The piping and Pu remain from underground safety tests
  - Pu is present above the transuranic (TRU) waste limit of 100 nCi/g

Industrial Sites CAU 547

Player

- 650 feet of pipe
- Much of pipe on sloping crater wall
- Soil covers only short lengths of pipe
- Small tanks and accelerometer

- Estimated 172 gms Pu in piping

Bernalillo

- 140 feet of pipe above grade - covered with soil
- 300 feet of pipe below grade
- Only 2 feet of pipe exposed
- Some structures within contaminated area

- Estimated 223 gms Pu in piping

Mullet

- 400 feet of pipe
- Partially disassembled
- Very little soil cover over pipe
- Soil contamination is present
- May be buried contaminated equipment

- Estimated 0.97 gms Pu in piping

Remediation Strategy

- Currently considering two remediation options
  - Clean Closure – Remove piping and dispose as TRU Waste
  - Close in Place – Cover with soil with long term monitoring
- Multiple options were reviewed for clean closure strategy
  - Remove pipe and dispose at location
  - Remove pipe in large lengths and ship off-site
  - Grout pipe and leave in place
  - Flush pipe and leave in place

Close in Place Option

Close In Place with Use Restriction (UR)

- Player
  - Cover all components with at least 3 ft of soil without breaching the piping and install a geo-textile material, fill geo-textile cells with material that is unattractive to rodents
- Mullet
  - Cover all components and soil contamination areas with at least 3 feet of soil and install geo-textile material and fill cells
- Bernalillo
  - Supplement existing cover as needed and install geo-textile material and fill cells
  - Investigate Tejon Vault and determine if filling is necessary

Close in Place Option

(continued)

- High profile features will be covered with soil using a retention structure
- Implement a UR and physical barriers (fencing) that prevents intrusion

Discussion Points

- The estimated cost of clean closure is significantly greater than that of closure in place.
  - Closure in place is estimated to cost about $2 - $3 million; the cost estimate for clean closure is about $30 - $35 million.
  - These costs appear to be only direct economic costs and do not consider the future costs of worker radiation exposure.
  - Exposure to workers in the clean closure scenario is potentially much higher, due to the cutting and handling of as many as 250 segments of contaminated pipe.
- Creating and maintaining a soil cover to last for over 1,000 years on an exposed slope is potentially challenging.

Committee Recommendations

- Close in Place option because it can be done safely and at significantly less cost
- Independent review of the stability of the soil cover design for the pipe on the slope wall of the Player site as extra assurance of the safety of the approach
- Immobilize the plutonium in place in the pipes, if a method can be found to do it safely

Soils
CAU 547
Background for Proposed Closure Recommendation

Soils Committee

January 12, 2011

Soils Sub-Project Strategy

- Federal Facility Agreement and Consent Order (FFACO) is the Resource Conservation and Recovery Act (RCRA) risk-based Corrective Action Process for the Nevada National Security Site (NNSS)
- By agreement:
  - annual dose is used for risk-based decisions
  - 25 mrem/yr dose limit is the action level

Determination of Dose

- Dose rate at a site is relatively constant
- Annual dose received from the site depends on the time exposed
- Therefore, dose must be converted to an annual potential dose using one of the three established exposure scenarios:
  - Industrial Area (2,250 hours per year)
  - Remote Work Area (336 hours per year)
  - Occasional Use Area (80 hours per year)

Exposure Assumptions

- Industrial Area Exposure Assumptions
  - 261 possible working days / year
  - Non-working 26 alternate Fridays
  - 10 days of vacation
  - Workers present 225 days / year, 10 hours / day for 25 years
  - Workers spend 1/3 of time outdoors

Exposure Assumptions
(continued)

- Remote Work Area Exposure Assumptions
  - Workers present 8 hours / day, 42 days / year, for 25 years
  - Workers spend 1/3 of time outdoors
- Occasional Use Area Exposure Assumptions
  - Workers present 8 hours / day, 10 days / year, for 5 years
  - Workers spend 100% of time outdoors

Determination of Dose

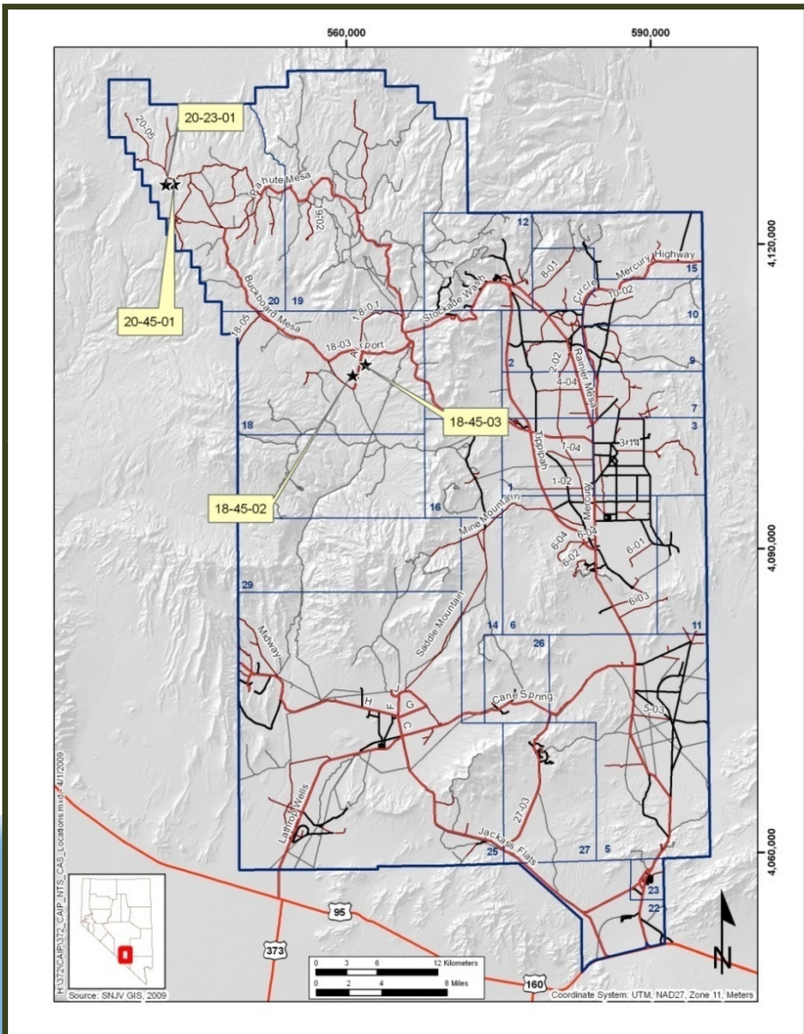
- Total annual dose estimated by separate estimates of the internal and external dose components
- Calculation of internal dose:
  - Analytical results of sieved surface soil
- Calculation of external dose:
  - TLD results

Any dose exceeding 25 mrem/yr (using appropriate exposure scenario) will require a corrective action

Corrective Action Alternatives

- FFACO describes three alternatives:
  - No Further Action
  - Clean Closure
  - Closure in Place
- Each alternative evaluated using Environmental Protection Agency screening and scoring methodology

CAU 372: Area 20 Cabriolet/Palanquin Unit Craters Map



- CAS 18-45-02, Little Feller I
- CAS 18-45-03, Little Feller II
- CAS 20-23-01, Palanquin
- CAS 20-45-01, Cabriolet

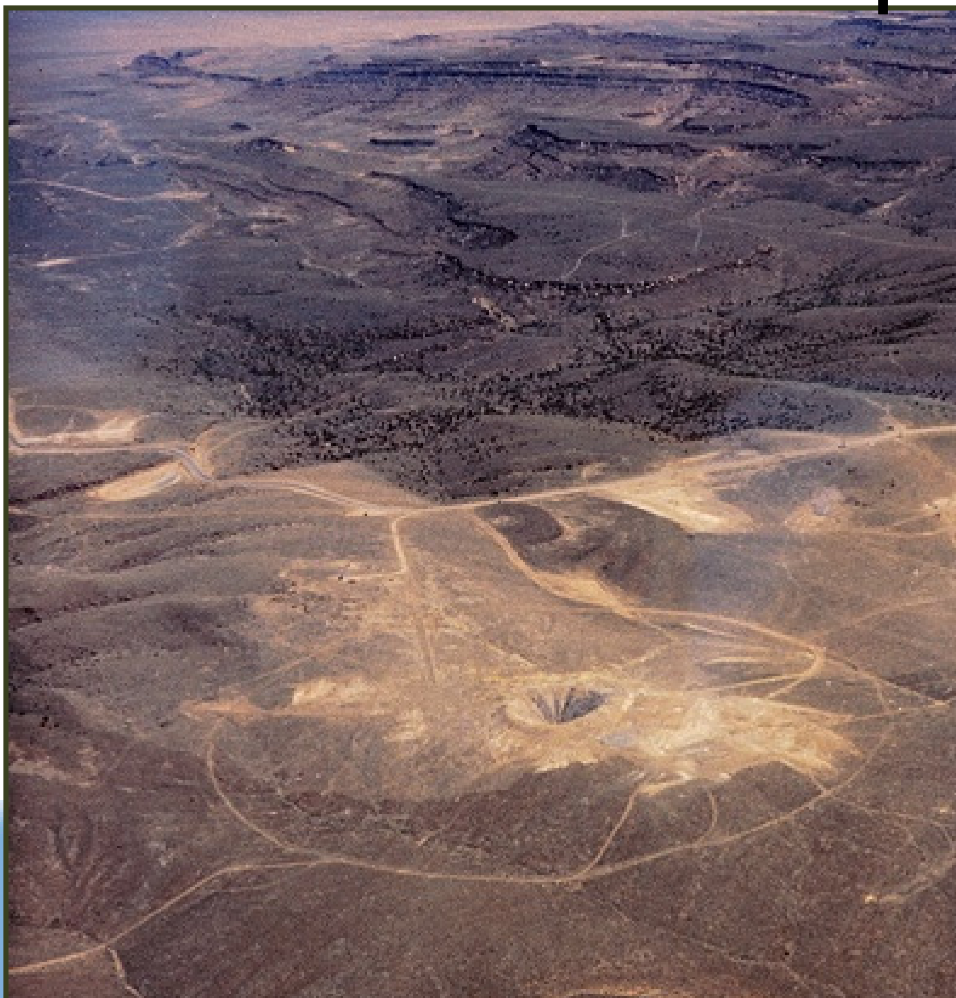
CAU 372
Little Feller I

- Weapons effects test
- Detonated July 17, 1962
- Detonated approximately one meter above ground surface

CAU 372
Little Feller II

- Weapons effects test
- Detonated July 7, 1962
- Detonated one meter above ground surface

CAU 372
Palanquin Test



- Plowshare experiment
- Yield of 4.3 kilotons
- Detonated April 14, 1965
- Depth of burial was 85 meters

CAU 372
Cabriolet Test

- Plowshare experiment
- Yield of 2.3 kilotons
- Detonated January 26, 1968
- Depth of burial was 52 meters

Estimated Costs

Closure in Place	~$ 40 K
•Monitoring not included	
•Monitoring (assumes no air monitoring)	~$ 5 K/year
Clean Closure	~$110 M

Committee Recommendation

- Closure in Place with Use Restrictions
- Remote Area Worker Exposure Scenario

Department of Energy
National Nuclear Security Administration
Nevada Site Office
P.O. Box 98518
Las Vegas, NV 89193-8518

JAN 10 2011

John McGrail, Chair
Soils Committee
Nevada Site Specific Advisory Board
232 Energy Way
North Las Vegas, NV 89030

NEVADA SITE SPECIFIC ADVISORY BOARD (NSSAB) SOILS COMMITTEE REQUEST FOR INFORMATION – CAU 374 (SCHOONER)

As requested at the December 13, 2010, Soils Committee meeting, following is the information regarding CAU 374 (Schooner) closure alternatives **ROM** Cost Estimate:

Clean Closure **~$260 M**

Based on removal and disposition of contaminated soil

Closure in Place **~$ 80 K**

Based on:

1. Removal and disposition of drums and miscellaneous waste at Buggy; and,
2. Development of the Use Restriction and installation of the posting

Yearly Inspection and Maintenance **~$ 5 K per year**

Should you have any comments or questions, please contact Cindy Lockwood at (702) 295-0968.

Robert F. Boehlecke
Federal Project Director
Environmental Restoration Project

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NNSA/NSO Read File

Study of Treatment Capability for Mixed Low-Level Waste at the Nevada National Security Site

Frank DiSanza
Federal Project Director
Nevada Site Specific Advisory Board (NSSAB)
November 10, 2010

Nevada National Security Site (NNSS) Waste Disposal Background

- Since the 1960s, low-level waste has been disposed at Area 5 Radioactive Waste Management Site (RWMS)

- Existing Mixed Low-Level Waste (MLLW) disposal unit (Pit 3) will close in November 2010
- A new MLLW disposal unit (Pit 18) will open in early 2011

MLLW Treatment

- Some types of MLLW must be treated prior to disposal to ensure the waste meets disposal requirements
  - Example: MLLW containing liquids
- Most generators currently utilize commercial waste treatment capabilities
  - Existing commercial facilities are not capable of treating classified MLLW due to security requirements
- MLLW treatment at the NNSS would require a State of Nevada permit
- Only Department of Energy (DOE) waste (non-commercial) would be accepted for treatment

Exploring the Benefits of Treatment at NNSS

- Would allow DOE and State of Nevada Division of Environmental Protection (NDEP) additional oversight
  - Existing commercial facilities are located outside the state of Nevada
  - NDEP would oversee treatment versus relying on out-of-state regulators
  - Waste treatment would continue to be verified in accordance with the Radioactive Waste Acceptance Program

Exploring the Benefits of Treatment at NNSS (continued)

- Would allow for more DOE control of the waste treatment process for wastes destined for ultimate disposal at the NNSS

- Would provide treatment capabilities within the DOE Complex

Evaluation of Treatment Technologies

- At the request of DOE, the Nevada Site Office Management and Operating contractor (National Security Technologies, LLC) began an evaluation with the objectives to:
  - Provide a conceptual study of waste treatment needs (i.e., demand)
  - Identify potential waste treatment technologies to meet demand
  - Analyze implementation considerations for initiating MLLW treatment at the NNSS

Evaluation of Treatment Technologies
(continued)

- A review of DOE complex-wide waste generation forecast data indicates that current and future Departmental demand for mixed waste treatment capacity will remain steady and strong
- Analysis and screening of over 30 treatment technologies was narrowed to four (4) to align with the MLLW streams projected to be generated across the DOE Complex:
    1. Macroencapsulation
    2. Stabilization/Microencapsulation
    3. Sort and Segregation
    4. Bench-scale Mercury Amalgamation

Evaluation of Treatment Technologies
(continued)

- Macroencapsulation definition specifies a *coating* of the waste/debris using resins, plastics, or cementitious materials

- Stabilization/Microencapsulation definition indicates it is applicable to waste streams, and specifically *limits* its main ingredients to cementitious materials

Evaluation of Treatment Technologies
(continued)

- Sort and Segregation would be employed to provide waste minimization by removing non-regulated components and/or prohibited items from MLLW

- Bench-scale Mercury Amalgamation would be used to treat small amounts of mercury from received waste

Historical and Projected MLLW Volumes for the Two Major Treatment Types

Technology	Total Historical Waste Volumes (ft^3) (2006-2009)	Total Projected Range Median Value* (ft^3) (2010-2016)	Average Projected Average Annual Volume (ft^3) (2010-2016)
Macroencapsulation/ Microencapsulation	114,273	464,950	66,421
Stabilization	19,680	50,700	7,243
Totals	**133,953**	**515,650**	**73,664**

MLLW = mixed low-level waste
ft^3 = cubic feet

NNSS Logistics

- Funding would be necessary to:
  - Prepare permit application
  - Minor upgrades to existing facilities
  - Procurement of treatment equipment
- No new facilities would have to be constructed
  - Anticipate using the existing mixed waste storage facilities
- Waste requiring treatment would be shipped in the same manner as LLW
  - Department of Transportation compliant and must meet NNSS Waste Acceptance Criteria

NNSS Logistics
(continued)

- Most waste successfully treated at the NNSS would be disposed on-site
  - Some waste may require additional off-site treatment if a non-permitted item were discovered (e.g. incineration of organic liquid, thermal desorption of sludge, etc.)
  - Waste requiring off-site treatment would be sent to an appropriate Treatment, Storage and Disposal Facility for treatment

Permitting

- Obtaining a permit would require the Nevada Site Office to complete the Resource Conservation and Recovery Act permitting process with pre-application public meeting, 45-day public comment of draft State of Nevada permit, etc.

Significant Permitting Elements

- **Waste Acceptance Criteria**
  - Mandate shipment and receipt only of waste streams that can be successfully treated by the selected technologies
- **Treatment technologies specifications**
  - Demonstrate treatment technology can meet Land Disposal Restrictions (LDR) treatment requirements
- **Waste Analysis Plan**
  - Specify the sampling and analysis which will need to be performed on treated wastes to verify treatment has met LDR requirements prior to disposal

NSSAB Involvement

- The Nevada Site Office requests the NSSAB provide a recommendation evaluating if the Nevada Site Office should pursue submitting an application to NDEP for a Mixed Waste Treatment permit at the NNSS
  - Recommendation due no later than the end of January 2011

DOE/NV/25946--1109

Conceptual Evaluation for the Installation of Treatment Capability for Mixed Low-Level Waste at the Nevada National Security Site

DOE/NV/25946--1109

Conceptual Evaluation for the Installation of Treatment Capability for Mixed Low-Level Waste at the Nevada National Security Site

Prepared for
National Security Technologies, LLC
Las Vegas, Nevada

EXECUTIVE SUMMARY

National Security Technologies, LLC, initiated an evaluation of treatment technologies that they would manage and operate as part of the mixed low-level waste (MLLW) disposal facilities at the Nevada National Security Site (NNSS). The NNSS Disposal Facility has been receiving radioactive waste from the U.S. Department of Energy (DOE) complex since the 1960s, and since 2005 the NNSS Disposal Facility has been receiving radioactive and MLLW for disposal only. In accordance with the Resource Conservation and Recovery Act (RCRA), all mixed waste must meet land disposal restrictions (LDRs) prior to disposal. Compliance with LDRs is attained through treatment of the waste to mitigate the characteristics of the listed waste hazard. Presently, most generators utilize commercial capacity for waste treatment prior to shipment to the NNSS Disposal Facility. The objectives of this evaluation are to provide a conceptual study of waste treatment needs (i.e., demand), identify potential waste treatment technologies to meet demand, and analyze implementation considerations for initiating MLLW treatment capacity at the NNSS Disposal Facility.

A review of DOE complex waste generation forecast data indicates that current and future Departmental demand for mixed waste treatment capacity will remain steady and strong.

Analysis and screening of over 30 treatment technologies narrowed the field of treatment technologies to four:

- Macroencapsulation
- Stabilization/microencapsulation
- Sort and segregation
- Bench-scale mercury amalgamation

The analysis of treatment technologies also considered existing permits, current the NNSS Disposal Facility infrastructure such as utilities and procedures, and past experiences such as green-light and red-light lessons learned.

A schedule duration estimate has been developed for permitting, design, and construction of onsite treatment capability at the NNSS Disposal Facility. Treatment capability can be ready in 20 months.

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TABLES

FIGURES

ACRONYMS

CFR	Code of Federal Regulations
DHP	Drum Holding Pad
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	foot
ft^3	cubic foot
HDPE	High density polyethylene
LDPE	Low density polyethylene
LDR	Land Disposal Restriction
LLW	low-level waste
MLLW	mixed low-level waste
NDEP	Nevada Division of Environmental Protection
NNSS	Nevada National Security Site
RCRA	Resource Conservation and Recovery Act
RTR	Real-Time Radiography Building
SIS	Sprung Instant Structure
SPSS	Sulfur Polymer Stabilization/Solidification
TP	TRU Pad
TPCB	TRU Pad Cover Building
TRU	transuranic
VERB	Visual Examination and Repackaging Building

1. INTRODUCTION AND BACKGROUND INFORMATION

1.1 INTRODUCTION

The objective of this report is to provide a preliminary evaluation of potential treatment technologies and their installation at the Nevada National Security Site (NNSS) Disposal Facility, including treatment technology types and permitting timeframes. The treatment technologies under consideration are those technologies that could be used to treat U.S. Department of Energy (DOE) generated mixed low-level waste (MLLW) in order to meet Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDRs) prior to landfill disposal at the NNSS Disposal Facility.

To achieve this preliminary evaluation, the report first looked at the potential treatment technologies set forth in the regulations and those known to be necessary through historical experience at the NNSS Disposal Facility. The evaluation then looked at the volumes, types of wastes, and their treatments that have historically been used prior to disposal at the NNSS Disposal Facility, as well as the volumes/wastes/treatments projected to be disposed at the NNSS Disposal Facility. This comparison found that the viable treatment options would be:

- Macroencapsulation
  - Portland Cement
  - UltraTech Macro boxes®
- Stabilization/Microencapsulation
  - Portland Cement
- Sort and Segregation
- Bench-scale Mercury Amalgamation

To estimate the timeframe for implementing these technologies, the existing permits and existing facilities at the site were taken into consideration. It was estimated that the permitting, design, and construction activities could take approximately 20 months to complete.

Supporting documentation for this conceptual treatment capability report is included in Appendix A, "Combined Projected Waste Volumes."

1.2 SITE AND FACILITY DESCRIPTION

The NNSS Disposal Facility is a 1,200 square mile federal reservation located 60 miles north of Las Vegas, Nevada. Historically, the NNSS Disposal Facility has been used primarily for weapons testing and development. Low-level waste (LLW) and MLLW generated from onsite development activities have been treated and disposed at the NNSS Disposal Facility.

Nearly all mixed waste shipped for disposal in the mixed waste disposal unit is from offsite DOE generators, with only a very small fraction coming from onsite mixed waste generators.

Figure 1 provides an aerial view of the waste disposal complex on the NNSS Disposal Facility.

Figure 1. Nevada National Security Site Disposal Facility

1.3 DOE RADIOACTIVE WASTE DISPOSAL POLICY

U.S. Department of Energy Order DOE O 435.1, "Radioactive Waste Management," states that waste should be treated at the site at which it was generated, if practical, and if not, it should be treated at another DOE site. This policy reflects DOE's desire to develop adequate treatment capacity within its own system so that fluctuations in the commercial treatment markets do not significantly affect DOE's ability to generate, treat, and dispose of wastes from ongoing or planned projects. Development of mixed waste treatment capacity at the NNSS Disposal Facility is fully consistent with DOE policy and will enable the NNSS Disposal Facility and other DOE generators to utilize DOE treatment capability for many waste streams. Commercial treatment and disposal capacity will still be necessary for the many DOE waste streams that will not meet the NNSS Disposal Facility's waste acceptance and treatment criteria.

2. POTENTIAL TREATMENT TECHNOLOGIES

2.1 SUMMARY SCREENING OF TECHNOLOGIES

This section provides a brief listing of the potential treatment technologies that may be applicable for treating the MLLW types forecasted for disposal at the NNSS Disposal Facility. These potential treatment technologies are based on the technologies given in the regulations for meeting LDRs. Technologies for waste treatment are given in Title 40 Code of Federal Regulations (CFR) Part 268.42 and alternative technologies for debris wastes given in 40 CFR 268.45.

After looking at historical and forecasted waste streams and treatment types in Section 3 of this report, specific treatment technologies that may be practical at the NNSS Disposal Facility will then be recommended in Section 4. Potential RCRA LDR treatment technologies are summarized in Table 1.

Table 1. Potential LDR Treatment Technologies for MLLW and Debris

Land Disposal Restriction Treatment Technologies Screened	
Amalgamation	Macroencapsulation
Thermal desorption	Microencapsulation
Physical extraction	Mercury retorting
Gas venting	Metals/inorganic recovery
Biodegradation	Organics recovery
Carbon adsorption	Zinc smelting
Chemical oxidation/reduction	Stabilization
Combustion/thermal recovery	Steam stripping
Deactivation	Wet air oxidation
Fuel substitute	Controlled reaction
Vitrification	Chemical extraction
Lead smelting	Thermal extraction
Liquid extraction	Biological destruction
Neutralization	Chemical destruction
Polymerization	Thermal destruction
Precipitation	Sealing

2.2 MACROENCAPSULATION, STABILIZATION, AND MICROENCAPSULATION

The use of the terms macroencapulsation, stabilization, and microencapsulation to describe specific treatment technologies varies in this evaluation. In some cases, the reports used as data for Section 3 combined macro- and microencapsulation; therefore, the data in Section 3 are stated as macro/microencapsulation for one category and stabilization as another. However, from Section 4 forward, the evaluation combines stabilization and microencapsulation as one treatment technology because of actual regulatory definitions.

The definition of macroencapsulation as provided by 40 CFR 268.45 and 268.42 states that either a waste or waste debris can be subject to macroencapsulation. The definition specifies that macroencapsulation is a *coating* of the waste/debris using resins, plastics, or cementatious materials.

Conversely, the definition of stabilization (40 CFR 268.42) indicates that it is applicable to waste streams and specifically *limits* its main ingredients to cementatious materials (e.g., Portland cement or pozzolans). Microencapsulation (40 CFR 268.45) is stabilization applied to waste debris and is also *limited* to cementatious materials. Stabilization and microencapsulation are the same technology applied to different waste forms. In Section 4 and beyond, stabilization and microencapsulation will be viewed as the same technology for the sake of technology selection and design/construction estimates.

3. MLLW VOLUMES BY TECHNOLOGY EVALUATION

This section of the evaluation looks at the waste volumes and treatment types for wastes previously disposed at the NNSS Disposal Facility and those projected to be disposed at the NNSS Disposal Facility. The data indicated two treatment types constituted a significant portion of the waste streams: macro/microencapsulation and stabilization. Based on median range numbers, a projected annual average volume of approximately 73,664 cubic feet (ft^3) per year of MLLW will need macro/microencapsulation or stabilization treatment for future disposal at the NNSS Disposal Facility.

The treatment volumes by the two major treatment types, as derived from Tables 3 and 4, are summarized in Table 2 below.

Table 2. Historical and Projected MLLW Volumes for the Two Major Treatment Types

Technology	Total Historical Waste Volume (ft^3) (2006–2009)	Total Projected Range Median Value* (ft^3) (2010–2016)	Average Projected Average Annual Volume (ft^3) (2010–2016)
Macroencapsulation/ Microencapsulation	114,273	464,950	66,421
Stabilization	19,680	50,700	7,243
Totals	**133,953**	**515,650**	**73,664**
* Median values are derived from the ranges provided in Table 4.			

Sections 3.1 and 3.2 and Appendix A provide more details on historical and projected waste volumes and treatment types.

3.1 HISTORICAL MLLW VOLUMES

National Security Technologies, LLC, the prime contractor operating the NNSS Disposal Facility, supplied the data regarding historical treatment types and volumes.

This information is summarized in Table 3, which indicates the volumes by treatment type for the last four years.

Table 3. Historical Treatment Types for MLLW Disposed at the NNSS Disposal Facility 2006–2009

Technology Type	Treatment Volume Total (ft^3)
No sorption or solidification	136,383
Other – Waste lock, Aquadox, Multizorb, VTD Residue	22,672
Macro	114,273
Meets Concentration based LDR standards	1,741
Stabilization	19,680
Other (Provide LDR specific Treatment Technology Code)	295
Meets Concentration based LDR, Multizob, solidification, Macro, LDPE	3,699
Amalgamation	789
Total Waste Volume (ft^3)	**299,532**
LDPE = Low density polyethylene VTD = vacuum thermal desorption	

3.2 PROJECTED MLLW VOLUMES

Using two waste disposition forecasts provided to DOE by numerous governmental entities (e.g., national laboratories), the quantity of waste that could require treatment at the NNSS Disposal Facility from 2010 to 2016 was estimated to range from 61,800 ft^3 to 951,600 ft^3, or on average from 8,800 ft^3 to 135,900 ft^3 annually. The first forecast used for this projection included a database of different waste types and quantities where the NNSS Disposal Facility was identified as the disposal facility ("ToNNSS"). The second waste forecast used included similar information for wastes where the disposal facility had not been determined ("ToTBD"). The prescribed treatment methods of either macroencapsulation or stabilization/solidification were listed on these forecasts for some of the wastes; where not prescribed, assumptions were made on the treatment method(s) to be utilized.

The results of this exercise are summarized in Table 4.

Table 4. Projected Waste Volumes for MLLW to be Disposed at the NNSS Disposal Facility 2010–2016 by Treatment Type

Treatment Type	Waste Quantity Range (ft^3)
Macro/microencapsulation	54,000 to 858,000
Stabilization	7,800 to 93,600
Total Waste Volume (ft^3)	**61,800 to 951,600**

A more detailed table generated from the two waste disposition forecasts is included in Appendix A. Due to the projected small quantity (~1 liter/year) of elemental mercury mixed waste to be received at the NNSS Disposal Facility, the treatment of this waste stream is not reflected in Table 4 or the accompanying table in Appendix A.

4. SELECTION OF POTENTIAL TREATMENT TECHNOLOGIES

4.1 TREATMENT ACTIVITIES FROM HISTORICAL EXPERIENCE

After interviews and conversations with personnel operating the NNSS Disposal Facility, it was found that three specific activities that could be considered treatment should be included in any discussion of RCRA-permitted treatment activities. These treatment activities include sorting and segregation of wastes, amalgamation of small quantities of MLLW mercury, and use of the UltraTech Macro Box® as backup to macroencapsulation. Although sort and segregation may not be considered an actual treatment technology, it is viewed as a RCRA Part B permitted activity when conducted away from the waste generator's site. These three treatment activities have been identified as selected treatment technologies based on historical experience.

Sorting and Segregation Alternative

Historical experience at the NNSS Disposal Facility has shown that significant reductions in the amount of waste to be disposed of and/or the amount of waste needing treatment can be achieved through the sorting and segregating of wastes after they have been received. Having a "sort and segregate" alternative allows waste containers, especially legacy waste containers, to be opened and the wastes sorted and segregated into streams that require further treatment and those that do not require any treatment. This would greatly reduce the volume of wastes requiring treatment and subsequently requiring disposal in the RCRA permitted disposal facility at the NNSS Disposal Facility.

Bench-Scale Amalgamation

Historically, small quantities of MLLW liquid mercury have been found in things such as vials, switches, and thermostats during sort and segregation operations. These small quantities of MLLW mercury are difficult to dispose of because they require trans-shipping to an offsite facility for further treatment prior to being shipped back to the NNSS Disposal Facility for disposal. The ability to treat small quantities of MLLW liquid mercury by the process of bench-scale amalgamation would eliminate offsite shipping and treatment.

UltraTech Macro Box®

The UltraTech Macro Box® is a macroencapsulation system composed of high-density polyethylene (HDPE)/linear low-density polyethylene (LDPE) macro-liners housed within the NNSS Disposal Facility Waste Acceptance Criteria–compliant stainless steel boxes. These containers also meet RCRA LDRs for macroencapsulation. Although cost prohibitive for repetitive use, the containers are a patented technology with existing design specifications, and their use could be included in a RCRA treatment permit application with very little additional effort. As a result of little additional permitting effort, these boxes could provide an emergency or alternative form of macroencapsulation for waste debris that cannot be readily treated with Portland cement. An example would be waste streams with higher activity in which as low as reasonably achievable principles would potentially drive use of the macro box technology.

4.2 SELECTION OF POTENTIAL TREATMENT TECHNOLOGIES

In Section 2 of this evaluation, the potential treatment technologies available were listed; in Section 3 the treatments' historical and projected waste volumes were compared. This comparison found that macro/microencapsulation and stabilization composed the two most significant waste volumes and treatment technologies used and projected to be used at the NNSS Disposal Facility. In addition, historical experience at the site has indicated that sort and segregation and amalgamation of mercury on a small scale would be complementary to the encapsulation and stabilization technologies.

The following treatment technologies are recommended for installation at the NNSS Disposal Facility:

- Macroencapsulation
  - Portland cement
  - UltraTech Macro Boxes®
- Stabilization/Microencapsulation
  - Portland cement
- Sort and Segregation
- Bench-scale Mercury Amalgamation

The following list provides some examples of the specific treatment technologies and approaches for implementations which were initially screened for applicability to the waste streams and for installation at the NNSS Disposal Facility:

Macroencapsulation

- Grouting in carbon-steel boxes or drums
- Welded stainless steel containers
- UltraTech Macro Boxes®
- High integrity containers
- Portland cement and fly ash – Numerous
- Pozzolan (Chemfix Technologies Inc.)
- Chemically bonded Phosphate Ceramic Encapsulation
- Polyethylene encapsulation (LDPE and HDPE)
  - LDPE – single screw extractor (EnergySolutions)
  - HDPE – Pre-manufactured containers (Chemical Waste Management Inc., BOH Environmental LLC, and Ultra-Tech International Inc.)
- Asphalt (cold/hot mix)
- Thermosetting Resin (polyester and epoxy)
- Synthetic Elastomers (rubber)
- Ceramic silicone foam (Orbit Technologies)
- Dolocrete™ (calcined dolomitic binder material)
- Sulfur Polymer Cement (Newmont Mining Corp)

Microencapsulation

- Polyethylene encapsulation (LDPE and HDPE)
  - LDPE – single screw extractor (EnergySolutions)
  - HDPE – Pre-manufactured containers (Chemical Waste Management Inc., BOH Environmental LLC, and Ultra-Tech International Inc.)
- Portland cement and fly ash – Numerous

Stabilization

- Portland cement and fly ash – Numerous

Amalgamation – Bench-scale application

- Sulfur polymer stabilization/solidification
- Mixing with sulfur and small amounts of inorganic agents to stabilize mercury

A brief literature review of these specific technologies and an informal survey of two of the industries' largest existing treatment facilities determined the two treatment technologies that could most cost-effectively be applied at the NNSS Disposal Facility for encapsulation and stabilization would be the use of Portland cement or polyethylene resins.

Portland Cement vs. Polyethylene Resin

Portland cement and polyethylene macroencapsulation both offer many technological and economic advantages:

- Extruders and pugmills (cement mixers) are commercially available and have a long history of industrial use.
- The equipment and materials used in the processes are available off the shelf, except for specialized pour nozzles.
- Both technologies can be scaled or tailored to site-specific conditions and can be readily incorporated into existing facilities.
- The processes operate at low temperatures and need no off-gas treatment.
- Both media are commonly used and relatively inexpensive compared to other treatment processes.
- Both can be formulated to produce a waste barrier that is durable, leach resistant, and compliant with Nuclear Regulatory Commission guidelines and RCRA requirements for disposal of MLLW.

Selection of Portland Cement

Although polyethylene resin is extremely tough and flexible, has excellent chemical resistance, is easy to process, and is used at the two major MLLW commercial treatment facilities, Portland cement has been recommended for installation at the NNSS Disposal Facility for the following reasons:

- An operating cement batch plant is already constructed on site near the NNSS Disposal Facility.
- Portland cement qualifies as an accepted media for both macroencapsulation and stabilization/microencapsulation.
- Using an existing portable cement mixing truck, Portland cement could be used with a methodology that is approved by the regulators on a case-by-case basis, for performing macroencapsulation of large debris in place within the landfill cell.

Amalgamation of Elemental Mercury Mixed Waste

As noted above, approximately 1 liter/year of elemental liquid mercury mixed waste is projected during the mixed waste sort and segregation activities at the NNSS Disposal Facility. For this small quantity of waste, the NNSS Disposal Facility could use bench-scale equipment to carry out the amalgamation/ stabilization treatment. From a review of technical publications that address treatment of radiologically contaminated elemental mercury, and discussions with RCRA treatability laboratory personnel who have direct experience with treating this type of waste, two viable methods of treating elemental mercury mixed waste on a bench scale, which can result in a waste material being disposed in accordance with the U.S. Environmental Protection Agency (EPA) land disposal restrictions, include:

1. **Mercury Amalgamation** – Physical mixing of the waste liquid elemental mercury with a metallic compound (typically powdered sulfur) at room temperature resulting in formation of a stable mercury non-liquid compound, such as mercury sulfide. Additional chemical additives in relative small percent quantities are required to be mixed with the reacted mercury mixture to render it suitable for land disposal. The mercury amalgamation reaction is exothermic and will result in the evolution of some mercury-containing air emissions.
2. **Sulfur Polymer Stabilization/Solidification (SPSS)** – Physical mixing of the waste liquid elemental mercury with a powdered sulfur polymer cement to form a stable mercury sulfide compound, followed by heating to melt the compound while mixing. The mixture is then cooled to form a monolithic solid waste in which the stabilized mercury particles are microencapsulated within a sulfur polymer matrix, rendering this solid waste suitable for land disposal. This process was developed at Brookhaven National Laboratory.

Both elemental mercury treatment methods listed above involve evolution of mercury-containing emissions that are generated during treatment; therefore, at a minimum, the treatment would need to be performed under a laboratory fume hood. The mercury amalgamation requires only bench-scale mixing equipment, whereas the SPSS treatment method requires the reaction vessel to be placed under an inert gas atmosphere and be capable of heating the contents to approximately 130°C. To avoid the need for inert gases and heating devices, the bench-scale mercury amalgamation method is recommended for installation at the NNSS Disposal Facility within the Visual Examination and Repackaging Building (VERB).

Two key factors have been found to significantly impact the success of elemental mercury mixed waste treatment systems to yield a stabilized material that can meet EPA land disposal restrictions: (1) the presence of other inorganic contaminants in the liquid mercury and (2) the consistency of the mercury waste stream's composition. These are factors to consider in establishing waste acceptance criteria for elemental mercury mixed waste, and in arriving at a treatment "recipe" that consistently results in meeting the treatment objectives.

5. DESIGN, CONSTRUCTION, AND PERMITTING

5.1 DESIGN AND CONSTRUCTION REQUIREMENTS

Existing Facilities

The first task in examining the potential design requirements was to look at existing facilities at the NNSS Disposal Facility. The use of existing facilities would greatly reduce both design and construction costs and would reduce the permitting timeframe because the design drawings already exist for inclusion in the permit application. Presently at the NNSS Disposal Facility, the following facilities exist that could be used in a treatment and storage process. The brief description of these facilities also includes comments regarding design and construction changes that may be required to support a treatment process.

- **VERB** – Visual Examination and Repackaging Building
- **TP** – Transuranic (TRU) Pad
- **TPCB** – TRU Pad Cover Building
- **DHP** – Drum Holding Pad
- **Area 1 Cement mixing batch plant**
- **RTR** – Real Time Radiography Building
- **SIS** – Sprung Instant Structure (covered with gravel edges)

VERB – The VERB is a covered building, approximately 60 x 80 feet (ft), and contains a Permacon structure that is constructed to withstand negative air pressure with a curbed impervious floor. The air is currently emitted through a bank of HEPA filters. This structure could be used to perform treatments that may include sort and segregate, macro/microencapsulation, stabilization, and bench-scale amalgamation of elemental mercury. Air emission controls may have to be modified and permitted depending on the wastes accepted and treatment conducted. In addition, this area would need to be modified to include whatever process equipment is needed for the selected treatment technologies. For example, if treatment with a pozzolanic cement grout were selected, a pugmill mixer would be needed to keep the grout mix from setting up, and a grout pump/delivery system would need to be installed to transfer the grout to the treatment area within the VERB.

TP and TPCB – The TRU Pad is a large asphalt covered and bermed pad approximately 150 by 300 ft that was constructed to meet the engineering requirements for MLLW storage. The TPCB is an enclosed, soft sided building supported by a metal superstructure, which covers approximately one-half of the TRU Pad area. This building is currently used to stage wastes in an enclosed environment out of the weather. The TRU Pad and TPCB were constructed to meet RCRA engineering requirements and offer ample room to stage and store wastes prior to treatment and/or prior to disposal. Little or no construction activities would be required to include the areas for waste storage within a treatment process permit.

DHP – The Drum Holding Pad is a smaller (20 by 40 ft) cement bermed and covered pad that is currently used to accumulate drummed waste prior to being sent off site for disposition. This pad could also be included in an application for onsite treatment with little or no engineering or construction costs. This pad could be used to store smaller quantities of waste drums that may need to be stored separately from other waste streams.

Area 1 Cement Mixing Batch Plant – This existing plant, which is located on the NNSS Disposal Facility, but separate from the NNSS Disposal Facilities area, could be used to develop and mix a pozzolanic grout that would meet the requirements for treatment technologies such as stabilization and macro/microencapsulation. The existing fleet of mixer trucks could be used to deliver the grout to the pugmill at the VERB. Since this facility is not involved in the treatment process, but only delivers a product for the treatment, it would not need to be included in permit for MLLW treatment and would not represent any design or construction costs.

SIS and RTR – Other structures located at the NNSS Disposal Facility, such as the SIS and the RTR, could be used to support a treatment process, but at present would require specific engineering upgrades in order to meet requirements. The SIS, a soft-sided enclosed building, currently does not have an impermeable floor or berm, which would be required and most likely would be used to store waste. The RTR’s usable area is largely occupied by the radiography unit at the present time and would require significant modification to enlarge the building to obtain any usable area. Unless radiography is found to be a necessary step in the treatment process, the RTR should not be considered under a permit for MLLW treatment.

Design and Construction Requirements

Even if the existing structures and their existing design drawings are used, some portions of the treatment process would require the development of design drawings and treatment process specifications and the associated construction of the newly designed treatment processes. Table 5 identifies some of the design requirements and ensuing construction activities for the proposed treatment technologies.

Table 5. Design Requirements Utilizing Existing Facilities at the NNSS Disposal Facility

Existing Facility	Macro/Micro	Amalgamation	Storage
VERB	Cement pad and cover for material delivery and base for material preparation system (i.e., pugmill pad)	Bench-scale area amalgamation process and specifications for meeting LDR treatment standards	None
	Material preparation system design and specifications for meeting LDR treatment standards (i.e., HDPE heating system or grout pugmill mixing system)	Ventilation hood design	
	Material delivery system inside building to the treatment area (i.e., piping, hoses, nozzles)	Air emission control system modifications to deal with mercury vapors	
	Waste suspension system within containers to accomplish macroencapsulation		
TP/TPCB	None	None	Calculations of maximum waste volumes in consideration of waste codes and treatment volumes
DHP	None	None	Calculations of maximum waste volumes in consideration of waste codes and treatment volumes
Area 1 Cement Plant	None	None	None

DHP = Drum Holding Pad
TP/TPCB = TRU Pad/TRU Pad Cover Building
VERB = Visual Examination and Repackaging Building

5.2 PERMITTING REQUIREMENTS

Permitting Approach

Currently, the NNSS Disposal Facility holds a RCRA Part B permit for the landfill disposal of MLLW from the Nevada Division of Environmental Protection (NDEP). This permit only allows for the direct disposal of wastes that must be received in a RCRA LDR-compliant form.

The permitting structure could be changed in one of two ways:

1. **Major modification of the existing permit** to include treatment of MLLW and its associated storage.
2. **Issuance of a separate stand-alone permit** for the treatment of MLLW and its associated storage.

With either approach, the permitting process will require the same steps and take approximately the same time to conduct.

Significant Permitting Elements

Beyond selection of the actual treatment technologies, the following three elements will be significant in preparing the permit application. These elements may require substantial input from outside sources, such as vendors for the treatment specifications, generators for the waste acceptance criteria, and NDEP for the waste analysis plan. The following three elements and their impacts have been incorporated into the schedule estimate:

- Development of specific **Waste Acceptance Criteria** will mandate the shipment and receipt only of waste streams that can be successfully treated by the selected technologies.
- Determining and incorporating the **treatment technologies specifications** to demonstrate that the treatment technology can meet LDR treatment requirements.
- Development of the **Waste Analysis Plan**, which will specify the sampling and analysis, will need to be performed on treated wastes in order to verify the treatment has met LDR requirements prior to disposal.

5.3 ESTIMATED DESIGN, PERMITTING, AND CONSTRUCTION SCHEDULE

This section provides an estimated schedule for the design, permitting, and construction activities associated with the installation of the Portland cement and bench-scale amalgamation technologies at the NNSS Disposal Facility. The schedule indicates that these tasks could be completed in an estimated 20 month design, permitting, and construction timeline.

The schedule is based largely upon previous field experience with similar projects and contains these assumptions:

- Significant reduction in application preparation time can be achieved by utilizing sections of the existing Part B landfill permit.
- The NDEP review time will be only 75 days.
- Significant public comment for the purpose of delaying the application will not be given.
- Construction contractors’ access onto the secure the NNSS Disposal Facility will not be delayed.

APPENDIX A

COMBINED PROJECTED WASTE VOLUMES

FY2010 BLDD
Streams With NNSS Disposition Path

						Projected Disposition Qtys (M3)										
Wtype	SendingSite	Stream Name	CH/RH	Phys Form	Treatment Tech	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016+	FollowOn	FY 2010-2016 (M^3)	FY 2010-2016 (Ft^3)	FY2010-2016 Volumes by Facility
WASTE STREAM WHERE DISPOSAL LOCATION IS TO NNSS																
MLLW	Idaho	ICP MW treated	CH	Solids	None	171	88	88	169	215	0	0		731	25,804	
MLLW	Idaho	AMWTP treated MW for NNSS disposal	CH	Solids	None	0	0	0	0	0	0	0		0	0	
MLLW	Idaho	INL MLLW for disposal from commercial treatment	CH	Solids	None	16.57	16.57	16.57	16.57	16.57	16.57	579.95		679	23,982	
MLLW	Idaho	AMWTP ES-BC treated MW for NNSS disposal	CH	Solids	None	100	0	0	0	0	0	0		100	3,530	
MLLW	Idaho	CH MLLW resulting from accelerated INL RH TRU processing	CH	Debris Waste	Macroencapsulation	32	35	0	36	36	36	0		175	6,178	
MLLW	Idaho	ICP MLLW prev. treated	CH	Solids	None	0	0	0	0	0	0	0		0	0	
MLLW	Idaho	ICP MLLW	CH	Solids	None	4.16	45.79	87.45	12	24	36	192		401	14,169	
MLLW	Idaho	INL CH-MLLW Treatment onsite at Sodium Components Maintenance S	CH	Solids	Multiple/Various	2	2	2	2	2	2	38.63	96	51	1,787	
MLLW	Idaho	AMWTP Treated MLLW by PF M&EC for NNSS Disposal	CH	Solids	Incineration	191.58	0	0	0	0	0	0		192	6,763	
MLLW	Idaho	ICP MLLW (ARP)	CH	Solids	To Be Determined	39	5	5	5	5	5	10		74	2,612	
MLLW	Idaho	CH/RH MLLW resulting from accelerated INL RH TRU processing	RH	Solids	Stabilization/Solidification	0	0	0	45	45	45	0		135	4,766	89,591 Ft^3 Idaho
MLLW	Lawrence Berkeley	MW >Class A	CH	Solids	None	0.2	0	0	0	0	0	0		0	7	249 Ft^3 Lawrence Berkeley
MLLW	Lawrence Livermore	Mixed Waste for NNSS	CH	Solids	Macroencapsulation	0	7.211	0	0	0	0	0		7	255	8,986 Ft^3 Lawrence Livermore
MLLW	Los Alamos	ER MW to NNSS	CH	Solids	Multiple/Various	5	0	5	0	0	0	0		10	353	
MLLW	Los Alamos	10-100 MW drums from TRU to NNSS	CH	To Be Characterized	Multiple/Various	191	0	458	193	0	0	0		842	29,723	
MLLW	Los Alamos	Operational MW to NNSS	CH	Solids	Multiple/Various	1	0	2	1	1	1	36		42	1,483	
MLLW	Los Alamos	Non-routine MW to NNSS	CH	To Be Characterized	Multiple/Various	0	0	0	0	0	0	36		36	1,271	32,829 Ft^3 Los Alamos
MLLW	Nevada	CAU 116	CH	Debris Waste	Macroencapsulation	0	9	0	0	0	0	0		9	318	
MLLW	Nevada	CAU 114	CH	Debris Waste	Macroencapsulation	0	28	28	106	0	0	0		162	5,719	
MLLW	Nevada	CAU 113	CH	Debris Waste	Macroencapsulation	28	0	0	0	0	0	0		28	988	
MLLW	Nevada	CAU 117	CH	Debris Waste	Macroencapsulation	0.2	0	0	0	0	0	0		0	7	
MLLW	Nevada	Miscellaneous secondary MLLW from NNSS RTBF projects	CH	Homogeneous Solids	Macroencapsulation	1	1	1	1	1	1	0		6	212	7,244 Ft^3 Nevada
MLLW	Oak Ridge	Classified MLLW Treatment Residues	CH	Solids	None	0.5	0	0	0	0	0	0		1	18	
MLLW	Oak Ridge	040-K25-MLLW-2_NNSS	CH	Solids	None	0	0	0	0	0	0	0		0	0	
MLLW	Oak Ridge	11Z-MLLW-1_NNSS	CH	Debris Waste	None	0	0	0	0	0	0	0		0	0	
MLLW	Oak Ridge	13B-EnergX_MLLW-1	CH	Debris Waste	None	291.88	0	0	0	0	0	0		292	10,303	
MLLW	Oak Ridge	13B-MLLW-3_NNSS	CH	Debris Waste	None	0	0	0	0	0	0	0		0	0	
MLLW	Oak Ridge	042-IFDP-MLLW-4_NNSS	CH	Debris Waste	None	10.7	168.2	198.78	53.52	38.23	0	5806.57		6,276	221,543	10,321 Ft^3 Oak Ridge
MLLW	Paducah	Legacy MLLW	CH	Solids	None	18	0	0	0	0	0	0		18	635	
MLLW	Paducah	D&D and Inactive Facilities	CH	Debris Waste	None	36	0	0	0	0	0	0		36	1,271	1,906 Ft^3 Paducah
MLLW	Sandia - NM	MLLW, Class A, Unclassified, Solids, Macro	CH	Solids	Macroencapsulation	50	50	5	0	0	0	0		105	3,707	
MLLW	Sandia - NM	MLLW, Class A, Classified, Solids	CH	Solids	None	5	5	2	0	0	0	0		12	424	
MLLW	Sandia - NM	MLLW, > Class A, Classified, Solids	CH	Solids	None	5	5	3	0	0	0	0		13	459	
MLLW	Sandia - NM	MLLW, Class A, Unclassified, Solids	CH	Solids	None	10	10	5	0	0	0	0		25	883	5,472 Ft^3 Sandia - NM
MLLW	Savannah	Already Treated Waste - DP	CH	Final Waste Forms	Multiple/Various	2.5	1.3	0	0	0	0	0		4	134	
MLLW	Savannah	No Path To Disposal Waste	CH	To Be Characterized	To Be Determined	0	0	0	0	0	0	0		0	0	
MLLW	Savannah	Stabilized Organic Liquids	CH	Final Waste Forms	None	0	0	0	0	0	0	0		0	0	
MLLW	Savannah	Stabilized Depleted Uranyl Nitrate (DUN)	CH	Final Waste Forms	None	0	0	0	0	0	0	0		0	0	
MLLW	Savannah	Treated MLLW (10-100 n/Ci/g)	CH	Final Waste Forms	None	258	344	258	0	0	0	0		860	30,358	30,492 Ft^3 Savannah
MLLW	West Valley	Debris - TBD - Legacy (GTCA) (NNSS)	CH	Debris Waste	Multiple/Various	0	30	45	0	0	0	0		75	2,648	
MLLW	West Valley	Debris - TBD - New Projects (GTCA) (NNSS)	CH	Debris Waste	Multiple/Various	0	5	51	0	0	0	0		56	1,977	4,624 Ft^3 West Valley
					TOTAL ALL "To NNSS" WASTES	1470.29	856.071	1260.8	640.09	383.8	142.57	6699.15	96	11,453	**404,283**	
					TOTAL WITH "MACROENCAPSOLATION" AS TREATMENT TECH	111.2	130.2	34.0	143.0	37.0	37.0	0.0	0.0	492	17,382	
					TOTAL WITH "NONE" AS TREATMENT TECH	927.01	682.56	658.8	251.09	293.8	52.57	6578.52	0	9,444	333,386	
					TOTAL WITH "MULTIPLE/VARIOUS" AS TREATMENT TECH	201.5	38.3	563	196	3	3	110.63	96	1,115	39,375	
					TOTAL WITH "TO BE DETERMINED" AS TREATMENT TECH	39.0	5.0	5.0	5.0	5.0	5.0	10.0	0.0	74	2,612	
					TOTAL WITH "INCINERATION" AS TREATMENT TECH	191.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	192	6,763	

WASTE STREAM WHERE DISPOSAL LOCATION IS TO BE DETERMINED															
						Projected Disposition Qtys (M3)									
Wtype	SendingSite	Stream Name	CH/RH	Phys Form	Treatment Tech	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016+	FollowOn		
MLLW	Argonne	General TRU Waste - Requiring Handling (contains elemental lead)	CH	Solids	Multiple/Various	3.35	0.489	0.489	0.489	0.489	0.489	0		6	205
MLLW	Argonne	TRU Corrosive Waste	CH	Solids	Multiple/Various	1.946	0.106	0.106	0.106	0.106	0.106	0		2	87
MLLW	Hanford-RL	RH & Large Package Misc. Solids	RH	Solids	Multiple/Various	107.2	128.4	7.2	7.2	7.2	7.2	960.3	12	1,225	43,232
MLLW	Hanford-RP	RH LLMW Debris	RH	Debris Waste	Macroencapsulation	0	0	0	0	0	0	1186	582	1,186	41,866
MLLW	Hanford-RP	RH MLLW Spent Resin (IX Resin)	RH	Solids	Other Thermal Treatment	0	0	0	0	0	0	445	584	445	15,709
MLLW	Hanford-RP	RH MLLW Spent Resin (Eichrome Resin)	RH	Solids	Other Thermal Treatment	0	0	0	0	0	0	4.25	586	4	150
MLLW	Idaho	INL RWDP MLLW	RH	Solids	Multiple/Various	0	0	0	0	0	0	0		0	0
MLLW	Lawrence Berkeley	Organic contaminated Solids	CH	To Be Characterized	Multiple/Various	0	0	1.2	0	0	0	0		1	42
MLLW	Lawrence Berkeley	Miscellaneous Debris	CH	Solids	Sort/Segregate	0	0	0.23	0	0	0.49	0		1	25
MLLW	Lawrence Berkeley	Reactives	CH	Organic Liquids	Other	0	0	0	0	0	0	0	1632	0	0
MLLW	Lawrence Berkeley	Stabilization	CH	Liquids	Stabilization/Solidification	0	0	0	0	0	0	0	1632	0	0
MLLW	Lawrence Berkeley	MLLW Sources	CH	Solids	None	0.2	0	0	0	0	0	0		0	7
MLLW	Lawrence Livermore	Dep-U Chips and Turnings	CH	Specific Waste Forms	To Be Determined	0	0	0	1	0	0	12.3		13	469
MLLW	Lawrence Livermore	Granular Activated Carbon	CH	Homogeneous Solids	To Be Determined	0	0	0	0	1	1	0		2	71
MLLW	Lawrence Livermore	Reactives	CH	Solids	Neutralization	0.2	0.1	0.2	0.1	0.2	0.1	5.5		6	226
MLLW	Los Alamos	10-100 MW drums from TRU to commercial	CH	To Be Characterized	Multiple/Various	0	0	0	0	0	0	0		0	0
MLLW	Los Alamos	ER MW to commercial	CH	Solids	Multiple/Various	8987	3377	234	260	445	445	0		13,748	485,304
MLLW	Los Alamos	Non-routine MW to commercial	CH	To Be Characterized	Multiple/Various	0	0	0	0	0	0	1800		1,800	63,540
MLLW	Los Alamos	Operational MW to commercial	CH	To Be Characterized	Multiple/Various	10	10	7	8	8	8	288		339	11,967
MLLW	Oak Ridge	Spallation Neutron Source RH Mixed LLW	RH	Solids	To Be Determined	3	3	3	3	3	3	105		123	4,342
MLLW	Oak Ridge	Spallation Neutron Source RH Mixed LLW	RH	Liquids	To Be Determined	0.03	0.03	0.03	0.03	0.03	0.03	1.05		1	43
MLLW	Oak Ridge	040-MLLW-7_TBD	CH	Solids	To Be Determined	0	0	0	0	10.19	10.19	10.19		31	1,079
MLLW	Oak Ridge	041-IFDP-MLLW-3_TBD	CH	Debris Waste	To Be Determined	0	0	0	0.57	0	6.4	15.52		22	794
MLLW	Oak Ridge	041-IFDP-MLLW-4_TBD	CH	Soil/Gravel	To Be Determined	0	0	0	0	0	1597.07	6371.29		7,968	281,283
MLLW	Oak Ridge	042-IFDP-MLLW-2_TBD	CH	Organic Liquids	To Be Determined	0	2.26	2.26	0	1.25	0	17.06		23	806
MLLW	Oak Ridge	042-IFDP-MLLW-3_TBD	CH	Soil/Gravel	To Be Determined	0	0	0	0	21.24	21.24	0		42	1,500
MLLW	Oak Ridge	042-NPTD-MLLW-3	CH	Debris Waste	To Be Determined	0	0	0.22	0	0	0	0		0	8
MLLW	Oak Ridge	13B-NPTD-MLLW-7_COMM	CH	Debris Waste	To Be Determined	43.2	0	0	0	0	0	0		43	1,525
MLLW	Oak Ridge	042-IDIQ-MLLW-2_TBD	CH	Debris Waste	To Be Determined	1140.99	64.97	0	0	0	0	0		1,206	42,570
MLLW	Oak Ridge	042-IDIQ-MLLW-3_TBD	CH	Liquids	To Be Determined	5.2	0.09	0	0	0	0	0		5	187
MLLW	Oak Ridge	042-IDIQ-MLLW-4_TBD	RH	Debris Waste	To Be Determined	0.11	0.21	0	0	0	0	0		0	11
MLLW	Oak Ridge	042-IFDP-MLLW-5_TBD	CH	Debris Waste	To Be Determined	87.92	156.73	336.4	321.11	183.49	137.62	1964.89		3,188	112,542
MLLW	Oak Ridge	13B-EnergX_MLLW-2_TBD	CH	Debris Waste	To Be Determined	0	276.89	32.09	65.97	0	0	0		375	13,236
MLLW	Oak Ridge	13B-NPTD-MLLW-17_COMM	CH	Liquids	To Be Determined	0.3	0	0	0	0	0	0		0	11
MLLW	Oak Ridge	Alpha 5 MLLW	CH	Debris Waste	To Be Determined	4830	4605	0	0	0	0	0		9,435	333,056
MLLW	Oak Ridge	Beta 4 MLLW	CH	Debris Waste	To Be Determined	24	5	0	0	0	0	0		29	1,024
MLLW	Oak Ridge	WEMA MLLW	CH	Debris Waste	To Be Determined	0	396	0	0	0	0	0		396	13,979
MLLW	Paducah	GDP-MLLW	CH	To Be Characterized	To Be Determined	0	0	0	0	0	0	23716.7		23,717	837,200
MLLW	Portsmouth	D & D 3	CH	Liquids	Multiple/Various	0	0	183	183	183	183	3694		4,426	156,238
MLLW	Savannah	Aqueous Liquids for Onsite Treatment	CH	Aqueous Liquids/Slurries	Multiple/Various	0	0	0	0	0	0	0		0	0
MLLW	SLAC	Activated or Contaminated Smoke Detectors	CH	Debris Waste	Macroencapsulation	1.35	0.05	0.05	0.05	0.05	0.05	1.75		3	118
MLLW	West Valley	Debris - Future Projects (TBD)	CH	Debris Waste	To Be Determined	0	0	0	0	0	0	0		0	0
OTH	Fermi	Non-Radioactive Nevis Shield Blocks	CH	Solids	To Be Determined	0	0	0	0	0	0	0		0	0
OTH	Paducah	CaF2	CH	Solids	None	0	0.8	8	8	8	8	152		185	6,523
OTH	Paducah	HF Clean UP	CH	Solids	Neutralization	0	0.8	4	4	4	4	76		93	3,276
OTH	Paducah	UDS-D&D	CH	To Be Characterized	To Be Determined	0	0	0	0	0	0	0		0	0
UNK	Hanford-RP	D&D Waste	CH	Debris Waste	To Be Determined	0	0	0	0	0	0	0		0	0
														0	0
					TOTAL ALL TBD WASTES	15,246.0	9,027.9	819.5	862.6	876.2	2,433.0	40,826.8	5,028.0	70,092	**2,474,249**

COMBINED ToNNSS AND ToTBD

Total Contact Handled Identified for MACROENCAPSOLATION	112.6	130.3	34.1	143.1	37.1	37.1	1,187.8	582.0	1,682	59,366
Total Contact Handled Identified for STABILIZATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,632.0	0	0

Nevada Site Specific Advisory Board
FY 2011 Work Plan

(numbers reflect priority)	Task	Recommendation	Committee Assignment	Comm/FB Mtg	Due Date	Completion Date
1	**Review the Greater than Class C Waste Environmental Impact Statement**					
		Provide recommendation regarding potential NNSS impacts identified in the GTCC EIS	Full Board	TBD	TBD	
2A	**Closure strategy for Corrective Action Unit (CAU) 106, Frenchman Flat Atmospheric Sites, Corrective Action Decision Document (CADD)**					
		Provide recommendation either closing contamination identified above final action levels in place by limiting future access or removing contamination and disposing of contaminated waste in accordance with waste disposal regulations, or some combination of closure in place with limited material removal	Soils Committee	Tour of site Oct 2010 Briefing to Committee by DOE in March/April 2011	~~1/1/2011~~ TBD	
2B	**Closure strategy for:**					
	CAU 372, Cabriolet/Palanquin Unit Craters, CADD			Briefing to Committee by DOE in November 2010	Jan-11	
	CAU 374, Schooner Unit Crater, CADD			Briefing to Committee by DOE in December 2010	Feb-11	
	CAU 375, Buggy Unit Craters, CADD			Briefing to Committee by DOE in February 2011	TBD	
		Provide recommendation either closing contamination identified above final action levels in place by limiting future access or removing contamination and disposing of contaminated waste in accordance with waste disposal regulations, or some combination of closure in place with limited material removal	Soils Committee			

(numbers reflect priority)	Task	Recommendation	Committee Assignment	Comm/FB Mtg	Due Date	Completion Date
3	**Review three Corrective Action Sites that include plutonium contaminated pipe systems (CAU 547) currently located in Yucca Flat at the NNSS**					
		Provide recommendation to either close the CASs in place by limiting future access to the pipes or removing the pipes and disposing the contaminated waste in accordance with waste disposal regulations including disposal of transuranic waste at the Waste Isolation Pilot Plant in NM; if recommend leaving in place, provide recommendation as to type of protective measures to be put in place	Industrial Sites Committee	Tour of site Oct 2010 Briefing to committee by DOE in Oct 2010 Follow up committee briefing by DOE in December 2010	Jan-11	
4	**Review FY 2013 Baseline funding and determine budget prioritization by sub-project**					
		provide recommendation with specific budget prioritization list	Full Board	Briefing by DOE in Mar 2011	Mar-2011	
5	**Path forward for four radioactively contaminated train cars and two non-radioactively contaminated 120-ton locomotives used in association with the Nuclear Rocket Development Station are currently located at the EMAD facility (CAU 566)**					
		recommendation to either leave in place, disposal, or Board-suggested path forward (any final action by DOE will be coordinated through the State Historic Preservation Office)	Industrial Sites Committee	Oct-2010 Comm	Mar-2011	
6	**Evaluate if the Nevada Site Office should pursue submitting an application to the State of Nevada for a Mixed Waste Treatment permit at the Nevada Site Office**					
		recommendation regarding potential need for the Nevada Site Office to begin treating on and off-site generated mixed waste	Full Board	Briefing by DOE in November 2010	Jan-2011	

(numbers reflect priority) Task	Recommendation	Committee Assignment	Comm/FB Mtg	Due Date	Completion Date
7	**Review the revised draft FFACO Soils Strategy, (Chapter 4, Appendix 6)**				
	recommendation listing potential options for improvement	Full Board	Briefing by DOE in March 2011	May-2011	
8	**Conduct 2011 membership drive with recruitment beginning January 2011**				
	provide recommendation regarding slate of new NSSAB candidates	Membership Committee	Committee interviews candidates Feb 2011	Mar-2011	
9	**Create and Fill Student Liaison position on Full Board**				
	provide assistance to DOE in establishing a Student Liaison position on the NSSAB	Membership Committee	N/A	N/A	

Public Notification of Corrective Actions
December 6, 2010
Las Vegas, Nevada

The Department of Energy (DOE) will not be submitting any Corrective Action Unit (CAU) final Corrective Action Decision Documents (CADDs), CADD/Corrective Action Plans (CAPs), CADD/Closure Reports (CRs), or Streamlined Approach for Environmental Restoration (SAFER) Work Plans, proposing closure-in-place to the Nevada Division of Environmental Protection (NDEP), during the next 60 days.

Southern Nevada Public Reading Facility
c/o Nuclear Testing Archive
775 East Flamingo Road
Las Vegas, NV 89119

Northern Nevada Public Reading Facility
Nevada State Library and Archives
100 N. Stewart Street
Carson City, NV 89701-4285

No documents were submitted to the Public Reading Facilities during November 2010.

Public Notification of Corrective Actions
January 5, 2011
Las Vegas, Nevada

The Department of Energy (DOE) will not be submitting any Corrective Action Unit (CAU) final Corrective Action Decision Documents (CADDs), CADD/Corrective Action Plans (CAPs), CADD/Closure Reports (CRs), or Streamlined Approach for Environmental Restoration (SAFER) Work Plans, proposing closure-in-place to the Nevada Division of Environmental Protection (NDEP), during the next 60 days.

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