PLANS AND PROGRESS ON HANFORD MLLW TREATMENT AND DISPOSAL

Fluor Hanford
P.O. Box 1000, Richland, WA  99352

S. K. Moy
U.S. Department of Energy, Richland Operations Office
P.O. Box 550, Richland, WA  99352

ABSTRACT

Mixed low-level waste (MLLW) contains both low-level radioactive materials and low-level hazardous chemicals. The hazardous component of mixed waste has characteristics identified by any or all of the following statutes: the *Resource Conservation and Recovery Act of 1976* (RCRA), as amended; the *Toxic Substances Control Act of 1976*; and Washington State dangerous waste regulations.

The Fluor Hanford Waste Management Project (WMP) is responsible for storing, treating, and disposing of solid MLLW, which includes organic and inorganic solids, organics and inorganic lab packs, debris, lead, mercury, long-length equipment, spent melters, and remote-handled (RH) and oversized MLLW. Hanford has 7,000 cubic meters, or about 25%, of the MLLW in storage at U.S. Department of Energy (DOE) sites. Hanford plans to receive 57,000 cubic meters from on-site generators, or about 50% of DOE’s newly generated MLLW. In addition, the Hanford Environment Restoration Program and off-site generators having approved Federal Facility Consent Agreement site treatment plans will most likely send 200 cubic meters of waste to be treated and returned to the generators. Volumes of off-site waste receipts will be affected when the MLLW Record of Decision is issued as part of the process for the Hanford Site Solid Waste Environmental Impact Statement (EIS).

The WMP objective relative to MLLW is to treat and dispose of ~8000 cubic meters of existing inventory and newly-generated waste by September 30, 2006.

Current and future activities in support of this objective include the following:

- A heat exchanger/condenser unit was managed as mixed waste and shipped to Duratek’s Bear Creek facility where it was melted down and recycled to form steel shield blocks—saving disposal costs and disposal trench space.

- Fluor Hanford and the DOE have petitioned the U. S. Environmental Protection Agency (EPA) for a RCRA exclusion (“delisting”) to allow disposal of MLLW with U and P listed waste codes and subsequent treatment of leachate from the disposal trench.

- Fluor Hanford’s WMP is in the process of demonstrating thermal desorption as an alternative method of thermal treatment.
• Innovative treatment of radioactive lead solids has been initiated in fiscal year 2003.

INTRODUCTION

Fluor Hanford’s WMP has shown consistent success in treating and disposing of waste since the mixed waste disposal unit opened in 1999. The project met a Tri-Party Agreement milestone to treat and dispose of 1,644 cubic meters of waste in FY 2000, two years ahead of schedule. Since that time, the project has treated an additional 1,300 cubic meters of waste, both newly generated and Hanford legacy waste. These wastes included macro-encapsulated debris, solids stabilization, and small amounts of residues remaining from thermally treating organics.

Notwithstanding past success, the scope that lies ahead is significant, with large volumes of waste, a variety of waste types, and corresponding treatment requirements. Much of the waste is already being stored at the Hanford Central Waste Complex; however, even more significant, is the amount of waste expected to be generated from current and future cleanup activities. All MLLW in storage at the Hanford Site, and forecasted waste for the next five years are documented in the Land Disposal Restrictions (LDR) Report, the Hanford equivalent to a Site Treatment Plan.

HANFORD MIXED LOW-LEVEL WASTE SCOPE

Solid MLLW includes organic and inorganic solids, organic and inorganic lab packs, debris, lead, mercury, long-length equipment, spent melters, and remote-handled (RH) and oversized MLLW. Hanford has 7,000 cubic meters, or about 25%, of the MLLW stored at DOE sites, and plans to receive 57,000 cubic meters from on-site generators, or about 50% of DOE’s newly generated MLLW. In addition, the Hanford Environment Restoration Program and off-site generators having approved Federal Facility Consent Agreement site treatment plans will most likely send 200 cubic meters of waste to be treated and returned to the generators. Volumes of off-site waste receipts will be affected when the MLLW Record of Decision is issued as part of the process for the Hanford Site Solid Waste EIS.

These wastes are divided into categories, or waste streams, with the defining variable being the treatment required to allow the waste to meet LDR and be disposed of. The waste streams, along with the current inventory and five year forecast, are given in Table I.
Table I. Hanford MLLW by Waste Stream

<table>
<thead>
<tr>
<th>Waste Stream Number</th>
<th>Waste Stream Name</th>
<th>Current Inventory (m$^3$)</th>
<th>Five-Year Forecasted Generation (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLLW-01</td>
<td>LDR Compliant Waste</td>
<td>1120</td>
<td>285</td>
</tr>
<tr>
<td>MLLW-02</td>
<td>Inorganic Non-Debris</td>
<td>2740</td>
<td>74</td>
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<tr>
<td>MLLW-03</td>
<td>Organic Non-Debris</td>
<td>810</td>
<td>139</td>
</tr>
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<td>MLLW-04a</td>
<td>Organic/Carbonaceous Debris</td>
<td>1380</td>
<td>728</td>
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<tr>
<td>MLLW-04b</td>
<td>Non Organic/Carbonaceous Debris</td>
<td>140</td>
<td>803</td>
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<td>MLLW-05</td>
<td>Elemental Lead</td>
<td>430</td>
<td>80</td>
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<tr>
<td>MLLW-06</td>
<td>Elemental Mercury</td>
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<tr>
<td>MLLW-07</td>
<td>Remote Handled and Large Container</td>
<td>79</td>
<td>1353</td>
</tr>
<tr>
<td>MLLW-08</td>
<td>Unique Waste</td>
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<td>0</td>
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<td>MLLW-09</td>
<td>Lead-Acid and Cadmium Batteries</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>MLLW-10</td>
<td>Reactive Metals</td>
<td>18</td>
<td>2</td>
</tr>
</tbody>
</table>


WASTE TREATMENT PLANS

Fluor Hanford’s WMP is responsible for storing, treating, and disposing of solid MLLW at the Hanford Site. Relative to MLLW, the WMP has several specific objectives:

- Treat and dispose of ~8000 cubic meters of MLLW by September 30, 2006
- Support the needs of waste generators and promote “treatment by generator” activities
- Seek out or develop multiple commercial off-site DOE treatment services, or develop on-site capability as a backup
- Encourage the development of thermal treatment capability with commercial providers
- Keep the Central Waste Complex (CWC) open and operational, and in compliance with the appropriate requirements.

Non-Thermal Treatment

The goal of treating 500-750 cubic meters in FY 2003 will be achieved through a contract with Allied Technology Group, Inc (ATG). Debris from the MLLW-04a waste stream, which accounts for more than 80% of this volume, will be macroencapsulated. Debris macroencapsulation has been the mainstay of the MLLW treatment project to date, with ATG doing the majority of the work.

The remainder of the FY 2003 contract with ATG will treat radioactive lead solid waste by a newly-authorized macroencapsulation method. ATG is utilizing a jacket of inert inorganic material (grout) with a minimum thickness of two inches. The grout fills the interstitial spaces.
and comes into intimate contact with the waste to substantially reduce surface exposure to potential leaching media. This new approach has received concurrence from the State of Washington as meeting the treatment and performance requirements of 40 CFR 268.40 for lead macroencapsulation. It also meets the performance criteria for treatment and disposal of Hanford Category 3 waste. This will mark the first time that the Hanford MLLW Project has attempted a large-scale treatment of waste stream MLLW-05.

![Fig. 1. ATG Grouting of MLLW](image)

**Thermal Treatment**

Fluor Hanford is in the process of investigating, developing, and demonstrating thermal desorption as an alternative method of thermal treatment, to increase the options available and increase the possibility for success in meeting consent order commitments to perform thermal treatment (TPA Milestone M-91-12). The treatability demonstration at Perma-Fix Environmental will include a variety of wastes: wastes from labpack inventory (e.g., various waste codes, radiological isotopes, dose rates and physical packaging); and wastes from other organic waste streams such as particulates, absorbed liquids, sludges, resins, and solids, again with a variety of waste codes, radiological isotopes, dose rates and physical packaging.

**De-listing Petition**

Fluor Hanford has petitioned EPA for a RCRA exclusion (“de-listing”) to allow disposal of MLLW with U and P listed waste codes and subsequent treatment of leachate from the disposal trench. EPA has prepared a draft of this de-listing, which is now being reviewed by DOE and Fluor Hanford before formal public review.
CERCLA Disposal

Hanford is in the process of developing an Engineering Evaluation/Cost Analysis (EE/CA) that could result in a decision to dispose of 95% of our largest waste stream, MLLW-02, and a large portion of MLLW-01 (a total of approximately 3,700 cubic meters) in the onsite CERCLA cell, the Environmental Restoration Disposal Facility (ERDF).

EXAMPLES OF SUCCESS TO DATE

Direct Disposal

In the past two years, the Fluor Hanford MLLW project has disposed of 200 cubic meters of direct disposal waste from waste stream MLLW-01. This is waste that was placed into storage when existing regulations required the waste to be managed as MLLW; however, due to changes in regulations, or due to other regulatory interpretations (e.g., a “contained-in” determination), the waste was eligible for disposal without further treatment.

Debris Macroencapsulation

In the past three years, the Fluor Hanford MLLW project has treated and disposed of 1,179 cubic meters of debris from MLLW-04a and -04b. This was done primarily through a commercial treatment vendor. The waste was compacted, grouted, and encapsulated in a welded stainless steel container.

Stabilization

In the past two years, the Fluor Hanford MLLW project has treated and disposed of 51 cubic meters of inorganic waste from MLLW-02. This was done primarily through a commercial treatment vendor. The waste was stabilized using reducing agents.

Recycling

A heat exchanger/condenser unit was managed as mixed waste due to being F001-F005 “derived-from” waste. The condenser, 32 cubic meters in volume, was shipped to Duratek’s Bear Creek facility where it was cut up, melted down, and recycled to form steel shield blocks. This approach saved disposal costs and valuable disposal trench space.

Treatment by Generator

The WMP has been successful in getting a significant amount of waste treated by the generator to meet LDR prior to their sending it to us. This approach saves storage costs and obviates the need to handle the waste twice. In the past two years, 120 cubic meters of MLLW has been treated by the generator and disposed of by WMP.
UPCOMING CHALLENGES

A number of waste streams will be treated in the future for which either the technology has not been fully developed, or for which the commercial treatment capacity is limited. These streams include elemental mercury, high total organic carbon, reactive metals, and high curie/high dose waste, including remote handled MLLW.

CONCLUSIONS

The Fluor Hanford WMP has been successful in treating and disposing of Hanford Site MLLW, including a number of different waste streams and a variety of corresponding treatment processes. While efforts to date have concentrated on the larger waste streams, efforts will begin in the near future on smaller, more unique waste streams.