HAZARDOUS AND MIXED WASTE MANAGEMENT CHALLENGES AT THE LOS ALAMOS NATIONAL LABORATORY PLUTONIUM FACILITY

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ABSTRACT

Los Alamos National Laboratory's Plutonium Facility supports the U.S. Department of Energy in its national security strategic mission, advanced energy research, and environmental quality and waste reduction. In the environmental quality arena, proper management of hazardous and mixed waste is paramount. This paper discusses some of the waste management challenges and initiatives that have been utilized in the continuous quality improvement process that surrounds the LANL Nuclear Materials Technology Division's waste management activities. Topics discussed in this paper include regulation and management of hazardous and mixed waste at the Technical Area-55 Plutonium Facility; continuing efforts to ensure compliance with hazardous and mixed waste regulations; managing problematic waste like orphan waste, used oil, fluorescent lamps, and other mercury waste; and metals and printed circuit boards that are contaminated with radioactive nuclides. The lessons learned from these waste management challenges and initiatives provide useful insights for improving waste management and planning, which can be applied by others in the waste management arena.

INTRODUCTION

The University of California operates Los Alamos National Laboratory (LANL) for the U.S. Department of Energy (DOE). LANL's mission is to enhance global security by ensuring the safety and reliability of the U.S. nuclear weapons stockpile; reducing the threats to U.S. security with a focus on weapons of mass destruction; cleaning up the legacy of the Cold War; and providing technical solutions to energy, environment, infrastructure, and health and security problems.

The LANL Nuclear Materials Technology (NMT) Division is responsible for operating the Laboratory's Technical Area-55 (TA-55) Plutonium Facility and the Chemistry and Metallurgy Research Facility located at TA-3; however, the scope of this paper is limited to the Plutonium Facility, the primary function of which is to assist the DOE in its strategic missions in national security, advanced energy, and environmental quality. All plutonium processing occurs in the Plutonium Facility's Building 4 (PF-4). The DOE approved plutonium operations at TA-55 in April 1978. Since then, TA-55 has performed its principle missions in a safe manner: basic special nuclear material (SNM) research and technology development; processing a variety of plutonium-containing materials; preparing reactor fuels, heat sources, and nuclear pit manufacturing.[i] (1)

All NMT waste management activities are conducted through the Waste Management and Environmental Compliance Group (NMT-7). NMT-7 is responsible for compliant handling, storage, treating, and dispositioning waste that is generated at the Plutonium Facility. NMT-7 provides waste minimization, identification, and characterization support to waste generators; waste handling and packaging; and waste certification, in an expeditious and cost-effective manner. (2)

To accomplish its waste management mission, NMT-7 is divided into multiple teams: Low-Level Waste, Transuranic (TRU) Immobilization, TRU Solid Waste, Chemical Waste Collection, and Shipping and Receiving Operations. Multiple ancillary support activities surround these core functions; Figure 1 shows the organizational structure of the Group.

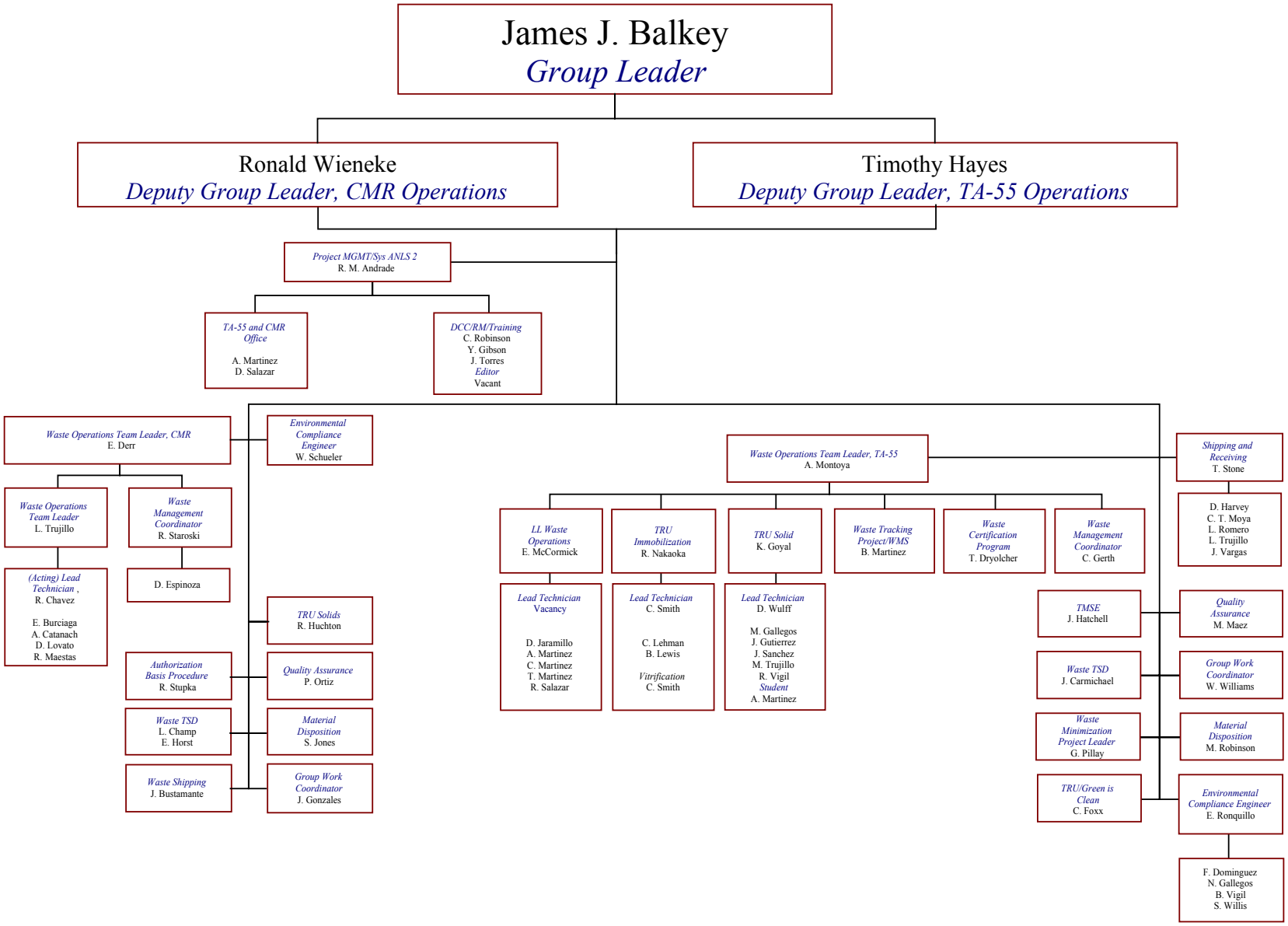
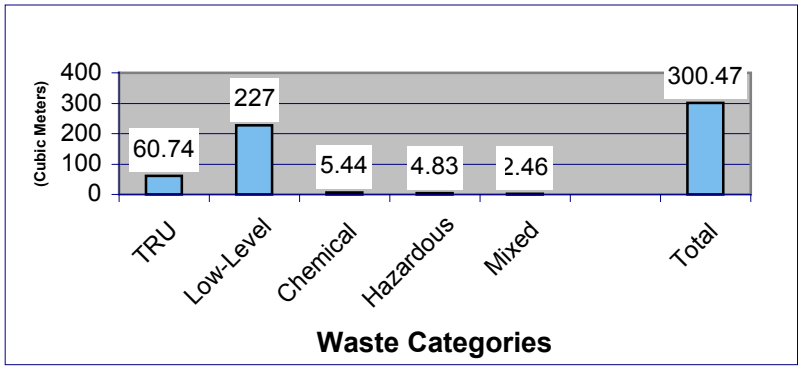


Figure 1. NMT-7 Organization Chart

GENERAL WASTE MANAGEMENT STATISTICS

Table I provides summary data on the amount of solid waste generated at TA-55 in fiscal year (FY) 1998. Three hundred cubic meters of waste was generated in FY98. The TRU data are comprised of TRU solids and cemented liquids. The low-level waste category contains both radioactive room trash and non-compactable waste (e.g., glass, metal tubing, and equipment); this category comprises the bulk of the waste generated in FY98. Chemical, hazardous, and mixed wastes comprise the remaining waste categories. These data do not include the acid, caustic, and industrial wastewaters that were sent to the TA-50 Radioactive Liquid Waste Treatment Facility.

Table I. TA-55 Waste Generation Summary for FY98



The hazardous and mixed waste fractions of the TA-55 Waste Categories comprise only 7.3 percent of the waste total; however, this 7.3 percent is highly regulated under the New Mexico Hazardous Waste Regulations. As a research facility, TA-55 has the capability of managing a large number of regulated hazardous and mixed substances and contaminants. Hazardous waste is made up of substances and contaminants that are assigned U.S. Environmental Protection Agency (EPA) waste numbers. TA-55 is authorized to manage 105 EPA waste types.

HAZARDOUS AND MIXED WASTE REGULATED AREAS AND UNITS

Chemical wastes that meet the definition of hazardous waste are managed under the requirements of the New Mexico Hazardous Waste Act. The implementing regulations are the *New Mexico Administrative Code* (NMAC), Title 20, Chapter 4, Part 1 (20 NMAC 4.1), "Hazardous Waste Management Regulations." These regulations are executed by the New Mexico Environment Department (NMED).

To effectively manage hazardous and mixed waste, TA-55 utilizes 29 regulated waste management areas, or units. As of November 1, 1999, there are 15 satellite accumulation areas (SAAs), one universal waste area, three less-than-90-day storage areas, and ten interim status units. Eleven of the 15 SAAs are located in PF-4, where mixed waste is stored.

The three less-than-90-day storage areas contain nonradioactive hazardous waste. The outside pad storage area, which is located west of PF-4, is primarily used to store hazardous waste solids such as fluorescent lamps and materials contaminated with hazardous waste regulated metals. The outside pad storage area is also used to store bulk, nonregulated chemical waste like latex paint, desiccants, and drummed rainwater that requires analysis to allow discharge to the LANL sanitary wastewater treatment plant. New Mexico Special Waste (e.g., asbestos, absorbed spilled nonhazardous chemicals, petroleum-contaminated soil) is also stored in this area. A second storage area located south of PF-4 on the south loading dock receives

primarily liquids in the form of chemicals and hazardous waste. A third storage area north of PF-4, opened in October 1999, presently receives hazardous waste solids.

There are ten mixed waste interim status units at TA-55, eight of which are mixed waste container storage units (CSUs), one cementation unit, and one storage tank system. Seven CSUs are located in PF-4, with a combined storage capacity of approximately 38,000 gal. All but one are located in the basement, these CSUs sit on a floor that is constructed of 10-inch-thick concrete, which is coated with a chemical- and temperature-resistant epoxy primer and paint to effectively prevent the migration of liquids into the concrete. These seven CSUs store three primary waste forms: low-level radioactive and mixed waste; TRU radioactive heterogeneous waste and mixed waste; and TRU radioactive homogeneous waste and occasionally TRU mixed waste from contaminated, listed, unspent, and unused hazardous waste.

The eighth CSU is located west of PF-4 in an area called the outside pad. This unit is a central collection point for radioactive and mixed waste generated in PF-4, where wastes are stored and prepared for shipment. This unit has a storage capacity of approximately 135,000 gal. of mixed waste.

Located in Room 401 are 13 column tanks, which are regulated under the New Mexico Hazardous Waste Management Regulations. The 13 column tanks comprise the PF-4 waste storage tank system, which stores evaporator salt concentrate liquids prior to solidification in the cementation unit.

Two subsystems comprise the tank system. Subsystem one consists of eight vertical glass columns, each with a 27-L capacity. The evaporator salt concentrate liquids are primarily concentrated nitric acid with plutonium^{239} salts. The evaporator salt concentrate is generated from solutions received from PF-4 ion exchange and infiltrate operations or from oxalate precipitation of plutonium.[ii] Once cooled, the evaporator salt concentrate liquids are transferred to one of eight tanks. The plutonium concentration is measured and, if below the discard level,[iii] the concentrated liquids are moved to the second subsystem of pencil tanks that support the cementation unit. If the plutonium concentration is too high, the residue is cycled back to ion exchange for further plutonium recovery.

The second subsystem of column tanks is made up of five vertical pencil tanks, each with a 55-L capacity. Each pencil tanks is constructed of 316 stainless steel, which is corrosion-resistant and compatible with the liquid waste that is stored in the tanks. Room 401 serves as a containment structure for the PF-4 storage tank system.

A cementation unit, which is used to solidify the evaporator salt concentrate liquids, is located in Room 401 and consists of a pH adjustment column and vacuum trap, two motor-driven mixers with propellers, associated support structures, and associated piping, all housed within a glove box. These liquids are mixed waste for corrosivity and toxicity characteristic metals, primarily chromium. No ignitable, reactive, or incompatible wastes may be cemented. Once treated, the resulting cemented waste is no longer hazardous and is managed as TRU homogeneous waste.

As discussed, the TA-55 mixed waste CSUs, storage tank system, and cementation unit are subject to New Mexico Hazardous Waste Regulations. Future plans for these units are presented in the *TA-55 Hazardous and Mixed Waste Part B Permit Application*. The permitting highlights related to this paper are the addition of a vitrification unit to treat evaporator solution residues and other mixed waste; the addition of 10 new pencil tanks to support the vitrification unit;[iv] combination of eight evaporator pencil tanks and their associated ancillary equipment into a new unit called the evaporator glove box tank; and creation of several new CSUs.

Waste Management and Planning

Hazardous and mixed waste management has a high degree of visibility within LANL, the DOE, and the state of New Mexico. Improved waste management and planning are paramount to the continuous quality improvement process that surrounds NMT's waste management activities. These waste management activities include permitting TA-55 mixed waste interim status units; reducing the number of SAAs; establishing daily waste collection procedures; instituting a waste cost recharge system, and coordinating direct off-site shipment from the Plutonium Facility to an off-site waste disposal facility.

The Plutonium Facility's mixed waste storage units and the cementation unit have interim status under 20 NMAC 4.1 and the RCRA. The NMED oversees the implementation of the New Mexico Hazardous Waste Regulations. The NMED is in the process of issuing a new LANL Hazardous Waste Permit, which was originally distributed on November 8, 1989. The Plutonium Facility interim status units will eventually be incorporated into this new permit. To facilitate improved solidification of mixed waste (predominately TRU and mixed TRU waste high in heavy metals, like chromium), the Plutonium Facility plans to permit a vitrification unit. Vitrification of TRU and TRU mixed waste will allow greater actinide loading, which will reduce the number of 55-gal. drum equivalents that will eventually be shipped to the WIPP. The cementation unit will be used to cement waste streams that are not good vitrification candidates, or as a backup unit to the vitrification unit. Future plans are to permit an organic destruction unit (the Hydrothermal Processing Unit [HPU]), which will have the capability to destroy primarily radioactive contaminated solvents and used oil. The pilot HPU will operate under a hazardous waste treatability study during fiscal year 2000. Data collected from this study will be used to show the technical feasibility of permitting the HPU as a mixed waste treatment unit.

Continuous compliance with all regulations—specifically; the New Mexico Hazardous Waste Regulations—is both a LANL and Plutonium Facility goal. The Plutonium Facility utilizes multiple ways to ensure continuous compliance with regulations like hazardous constituent substitution and waste reduction. However, constituent substitution has an end point, and waste reduction proves to be difficult during times of increased activity. Therefore, another technique to improve continuous compliance is to reduce the number of SAAs managed by NMT waste generators.

Before this reduction effort, SAAs at TA-55 numbered 38. As of November 1999, there are 15 SAAs at TA-55. With the reduced number of SAAs, NMT instituted daily waste collections involved mainly hazardous and some mixed chemical waste.[v] The remaining SAAs store mixed waste that is not easily removed from radiological control areas (RCAs). Daily waste removal activities occur all day long, but typically are concentrated at the end of the 10-hour workday. Waste is transferred to NMT-7's possession, where it is transported to a less-than-90-day storage area, or occasionally is placed into an interim status storage unit. To ensure that the waste received has been fully characterized, each waste stream must have a completed Waste Profile Request Form on file with NMT-7. In addition, a completed Waste Acceptance Form is required each time waste is transferred to NMT-7. During daily waste collection activities, NMT - 7 personnel conduct daily inspections at all SAAs, scan the research laboratories for potential waste storage problems, and consult with waste generators to answer waste management questions. Furthermore, NMT-7 staff are available to collect waste throughout the 10-hour workday.

LANL and TA-55 staff also use a variety of initiatives and management tools to improve waste management. The first initiative is the waste cost recharge system imposed by the DOE. It is hoped that this recharge system will improved waste planning,[vi] characterization, and waste minimization by forcing the waste generating organization to bear some of the cost of waste disposal.

A second initiative is arranging for direct off-site shipments of nonradioactive hazardous and chemical wastes. These direct off-site shipments are initiated through LANL's Solid Waste Operations. Significant cost savings occur by not handling the waste twice.[vii] Direct off-site shipments also reduce the amount of

paperwork and waste tracking. NMT is currently exploring the possibility of direct off-site shipments of low-level mixed waste.

A management tool used to improve safety and waste management operations is Integrated Safety Management (ISM). Both workers and managers are trained to identify safety concerns and process improvements by utilizing the five-step ISM process: 1) define the work; 2) analyze the hazards; 3) develop and implement controls; 4) perform the work; and 5) evaluate the work, looking for improvements that can be implemented the next time work is performed. Utilization of this technique continually improves safety and waste management aspects of each operation.

Another management tool is the use of management walkarounds to ensure compliance and document safety and health-related problems. Here, managers and trained staff utilize guidance cards that summarize requirements to evaluate a process or activity. Examples of guidance cards are Fire Protection Features, Glove Box Walk-down, and Management of SAAs (see Figure 2). Noteworthy practices, observations, and or deficiencies are documented and tracked in the management walkaround database, which tracks corrections and provides managers with information that is utilized to identify the root cause of challenging or positive tasks or activities.

GUIDANCE CARD

Number: WM.02 (TA55)	Functional Area: Waste Management
Rev: 2 (8/97)	Topic: Satellite Accumulation Areas (SAA)

References: 40 CFR 262, Standards Applicable to Generators of Hazardous Waste & 265, Interim Status Standards for Owners and Operators of Hazards Waste Treatment, Storage, and Disposal Facilitates
LIR-404-00-03, Hazardous and Mixed Waste Requirements for Generators

Lines of Inquiry

- Loading/unloading and storage areas are free of obstacles or deterioration that could cause a spill or accident or prevent access by emergency personnel and equipment. Areas are free of possible ignition sources and are dry and sheltered.
- Containers are to provide for visual inspection.
- Waste is under the control of the generator and is accumulated in containers at or near the point of generation.
- Containers are kept closed, are in good condition, and are compatible with the waste in the container.
- Containers are segregated according to the compatibility of the wastes that they hold.
- Containers holding liquids must have secondary containment.
- All users of an SAA will have their name and waste profile number on the respective containers or have an inventory system.
- All containers are properly labeled "HAZARDOUS WASTE" and the major constituents are listed. Containers that hold mixed waste are also labeled as "RADIOACTIVE WASTE". Note: If mixed waste is present, the requirements of the Radcon Manual also apply.
- Generators have accumulated less than a total 55 gallons of hazardous waste or 1 quart of acutely hazardous waste.
- Containers holding excess accumulation are marked with the date the excess began accumulating and are picked up within three calendar days from the time the amount was exceeded.
- Although not required, periodic inspections are performed and records are kept.
- Signs are readable and prominently posted.
- Hazardous waste leaks or spills are cleaned up immediately and the resulting material is also handled as hazardous waste.

Procedure:

- Review guidance card
- Inspect SAA (with waste coordinator, if available)
- Record observations based on comparison to the guidance card
- Document the results within 3 days

Figure 2. Satellite Accumulation Area Guidance Card

PROBLEMATIC WASTE STREAMS AND THEIR MANAGEMENT

Orphan Waste

Managing orphan waste (OW) is a challenging task for NMT-7. OW is defined as "waste that has been abandoned, having no known owner, and/or the contents of which are unknown." Orphan waste that is found within TA-55 is treated as a potentially contaminated item and requires radioactive analysis for complete characterization. Where OW is found determines the waste generator, who is responsible for all costs associated with waste disposal.

Most OW is generated due to the failure of an employee to properly label chemicals in storage and waste containers. NMT-7 provides training in waste management and environmental compliance that pertains to the management of OW and that has established a process flow diagram (Figure 3) to serve as a guide for proper management of orphan waste once discovered. According to Figure 3, the generator of the OW requires radioactive analysis for complete characterization, regardless of where the waste is found within the Plutonium Facility. Initially, Radiological Control personnel are contacted to verify whether the OW is contaminated. Subsequently, NMT-7 personnel are advised of the location of the OW, the Waste Management Coordinator of NMT-7 establishes an SAA for the OW at the location where it is found, if there is no waste storage area nearby or in the laboratory.[viii] The OW must be properly segregated with physical barriers and labeled accordingly for SAA storage requirements. Samples from the OW are submitted for radiological and hazardous waste analysis,[ix] and sample analysis results are used to determine the proper disposal method for the waste.

Used Oil

Used oil is one of the many different types of waste generated at the Plutonium Facility. Maintenance activities on elevators and vacuum pump operations within the Plutonium Facility generate used oil for recycle or disposal. Approximately 300 vacuum pumps support the activities inside the facility, and used oils are generated both inside and outside the RCAs. Control methods have been established for used oil to ensure regulatory compliance with DOE orders and 20 NMAC 4.1.

NMT-7 works closely with Johnson Controls Northern New Mexico, a contractor to LANL, to establish the control method for the used oil. The control method requires that used elevator and vacuum pump oil be nonhazardous to be recycled. Only authorized personnel are permitted to drain oil from a pump, regardless of pump's location or whom the pump serves. Used oils are collected in two separate areas within the Plutonium Facility: within the boundary of an RCA and external to the RCA. The waste generator and NMT-7 personnel are required to use a logbook to record the location and date the oil is generated and collected. This policy has enabled the NMT-7 to identify the generator/owner of the used oil. The waste generator is also required to record the characteristics of the used oil on a Waste Acceptance Form.

One control method for used oil requires facility personnel to use the Used Oil Process Flow Diagram (see Figure 4) as an aid to properly handle oil waste efficiently and consistently. Initially, an oil sample is removed and submitted for radioactive analysis when oil is drained from a vacuum pump. Used oil is subsequently drained, collected, and segregated according to facility group ownership and radiological content. After the waste container is filled to capacity (capacity ranges from 12.5 to 55 gal.), samples are taken and submitted for analysis.[x] Radioactive analysis is not required if the used oil did not originate from an RCA and initial radiological screening indicated no radioactivity.

Nonhazardous, nonradioactive used oils are recycled. Nonhazardous, radioactive used oils are immobilized with vermiculite in a 55-gal. drum and disposed as radiological waste. Hazardous and hazardous radioactive used oils are transferred to the LANL TA-54 permitted storage facility. All hazardous used oils are shipped off-site for thermal treatment. Hazardous radioactive used oils, depending

on activity levels, are shipped to Diversified Scientific Services, Inc. (DSSI) in Kingston, Tennessee for thermal treatment.[xi]

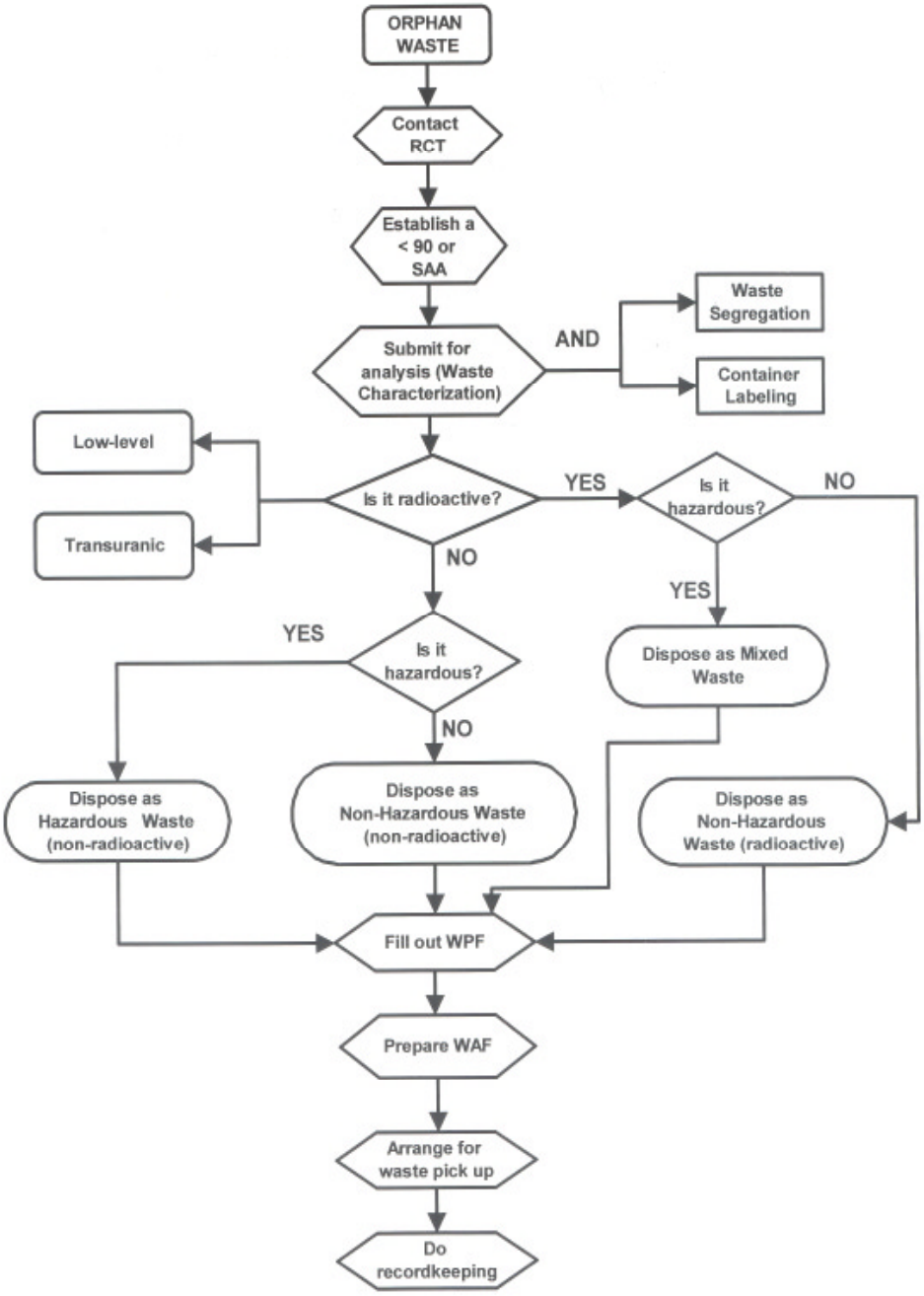


Figure 3. Orphan Waste Disposal Process

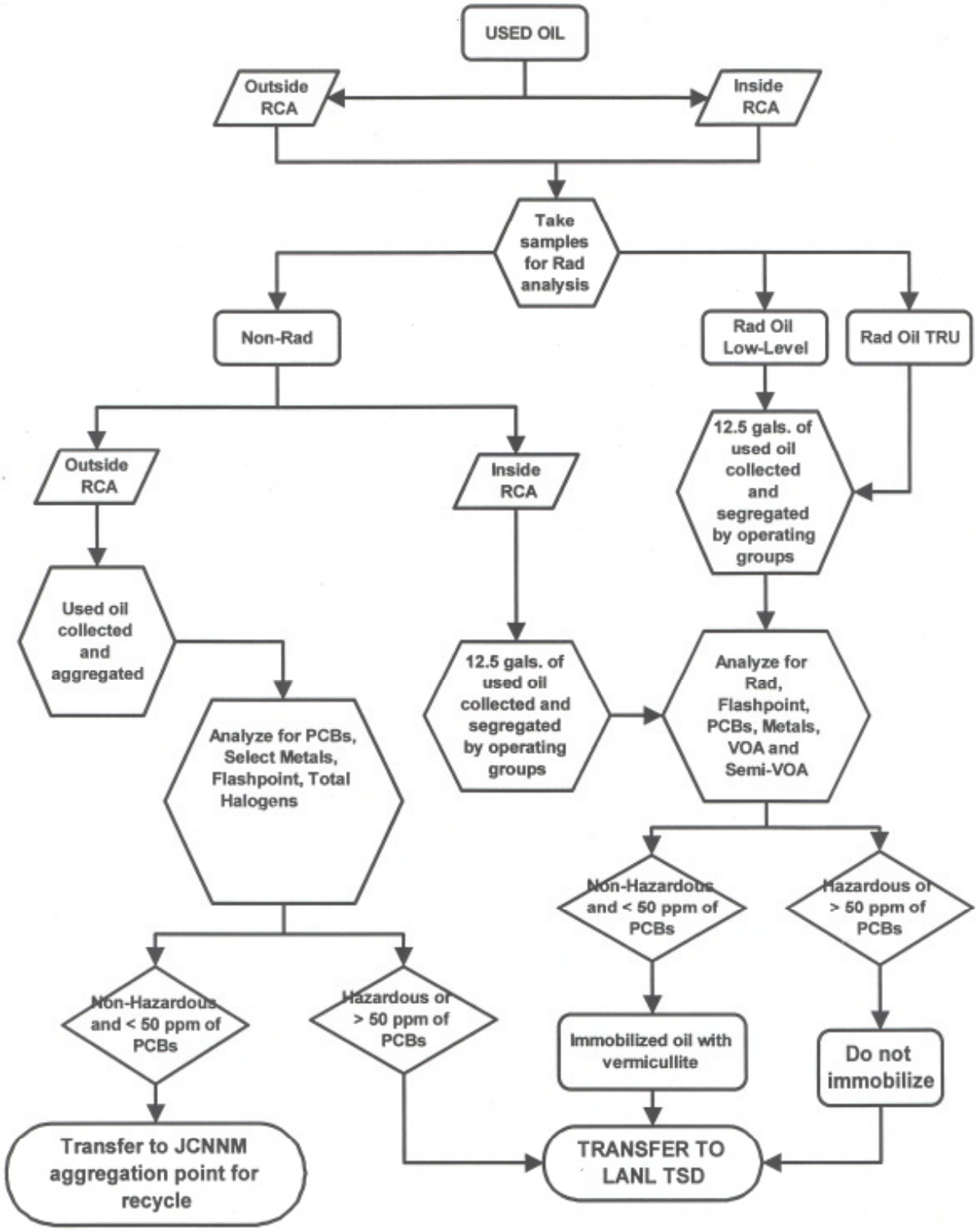


Figure 4. Used Oil Process

Fluorescent Light Bulbs

Fluorescent light bulbs contain mercury that may fail the toxicity characteristic limit of 0.2 mg/L. This waste stream is managed as hazardous or mixed waste. In PF-4, fluorescent light bulbs are likely to be plutonium-contaminated. Therefore, NMT administrative procedures require that an RCT smear or swipe all PF-4-generated light bulbs. If the smear result shows radioactive contamination, the bulbs will be decontaminated aggressively to minimize the generation of mixed waste. When the fluorescent light bulbs are free released, the bulbs are removed from the RCA and stored as hazardous waste. Within 90 days, the bulbs will be sent to a recycler to reclaim the mercury, glass, and metal end caps. If decontamination is not possible, the contaminated bulbs will be placed inside a plastic bag and managed as mixed waste.

This waste stream is problematic because of its volume and the fact that LANL relamping teams, electricians, and occasionally laboratory personnel generate fluorescent light bulbs. Fluorescent light bulbs can also appear in the unwanted nooks and crannies of the Plutonium Facility. However, because these light bulbs are easily identifiable, they are not managed as OW. To address this problem, LANL created relamping teams to replace and manage used fluorescent light bulbs. However, these relamping teams only manage fluorescent light bulbs when generated in non-RCAs because of the time lag to have the bulbs smeared or swiped for free-release. In PF-4, which is an RCA, relamping teams or electricians will replace light bulbs, but rely on NMT-7 staff for proper waste management. To ensure compliance storage, NMT-7 has placed additional staff on call to assist with the movement and collection of waste. A radiological survey is required prior to NMT-7 taking possession of the bulbs. If no survey is conducted, NMT-7 will not accept possession, except when compliant storage becomes an issue.

Mercury Waste

Mercury mixed waste, including elemental mercury, mercury salts, and mercury-contaminated debris (if below TRU levels [100 nCi/gram] and meets the isotope specific criteria) are shipped off-site for reclamation to Material and Energy Corporation, in Oak Ridge, Tennessee.[xii] If the mercury is in a liquid form and is contaminated with levels above TRU levels (100 nCi/gram), the mercury must be treated to remove the potential for the emission of mercury vapors. Treatment consists of converting the mercury from a liquid phase to an amalgamated solid by using zinc as an amalgamating mediator. This form of treatment is consistent with the required hazardous waste treatment standard for radioactive contaminated mercury.[xiii] Treatment is accomplished by using the components of a mercury spill kit, manufactured by SPILFYTER Innovative Spill Control (Product No. 520250) for the amalgamation process.[xiv]

Compliant treatment is accomplished through the generator waste treatment provisions in 20 NMAC 4.1, Subpart VIII, and incorporating by reference 40 CFR §268.7 (a)(4). Here, a waste analysis plan is written and submitted to the NMED 30 days prior to the plan treatment activity. The amalgamation process is conducted in a hazardous waste less-than-90-day storage area within 90 days after the mercury was first placed into the storage area.[xv]

Radioactive Contaminated Metals and Circuit Boards

Various types of metals (e.g., stainless steel, lead sheets, copper solder joints, and printed circuit boards) become contaminated with actinides and require decontamination before being free-released and sent off-site to a scrap metal recycler. If decontamination is unsuccessful, some metals must be managed as waste. Problematic metals are glove boxes with lead shielding, lead sheets, copper solder joints, and printed circuit boards. Without a recycling option, these metal waste streams would immediately become mixed waste. LANL's Decontamination Operations (Decon Ops) Facility at TA-50, used for decommissioning radioactively contaminated glove boxes and other waste items. Decontamination is achieved by removing the internal lead shielding and surface contamination. The Decon Ops Facility is located within a permitted CSU, which enables compliant storage of selected metals as mixed waste if decontamination is not successful. The types of decontamination methods used are: 1) rubbing down contaminated items with

Fantastic Cleaner; 2) high-temperature/high-pressure spray wash; and 3) use of a high pressure sponge jet that sprays small sponge particles at the area or item to be decontaminated. Initial scrap metal characterization and decontamination activities performed are not regulated under 20 NMAC 4.1, Subpart V, "Permitted Facility Requirements." If the scrap metal cannot be decontaminated, the scrap metal will be managed as low-level, transuranic, or mixed waste.[xvi] Lastly, scrap metal that contains a hazardous waste constituent must be decontaminated or declared a mixed waste within one year to ensure compliance with the speculative accumulation provisions of 20 NMAC 4.1.

CONCLUSION

Waste management activities at the Plutonium Facility use multiple management tools and initiatives to ensure compliance with DOE and state of New Mexico Waste Management Regulations. Management tools like the waste cost recharge system, arranging for direct off-site shipments, using the ISM and management walkarounds, help to save dollars, improve waste management, and protect safety and health of the TA-55 workforce. Improved planning through permitting waste management units, reducing the number of SAAs, and conducting daily waste collection activities helps to ensure compliance with a multitude of requirements. Problematic waste streams (e.g., radioactive OW and used oil) constantly challenge NMT-7 staff to find solutions to waste management issues. However, through proper planning, use of management tools, and adequate staffing, problematic waste streams present themselves as a challenge and not as a burden.

REFERENCES

1. LANL, Nuclear Materials Technology Division, "Final Safety Analysis Report of the Los Alamos National Laboratory Plutonium Facility," Los Alamos National Laboratory, 1996.

2. J. Balkey, Waste Management and Environmental Compliance Group, Los Alamos National Laboratory, 1997.

3. B. Kniss and T. J. Trapp, *Stockpile Management Program FY 1999 Technical Plan*, Los Alamos National Laboratory, 1999.

FOOTNOTES

i The pit rebuild mission assignment to LANL was made in 1993. Since that time, several key events have changed the focus of the program. One key factor was the Record of Decision granted to the Stockpile Management Programmatic Environmental Impact Statement (PEIS) in January 1996. This PEIS established LANL as the preferred option for manufacturing pits for the DOE. This provided new emphasis for the Pit Rebuild Project as the short-term embodiment of that manufacturing assignment. In 1997, the scope of the program was changed from the broader scope mission to "capture the technologies necessary to fabricate all types of enduring stockpile pits" to a narrower mission of "fabricating WR W88 pits on a short-time scale in order to support the stockpile."(3)

ii The objective of the evaporator is to reduce the volume of these effluents by evaporating most of the nitric acid in two evaporators. A nitric acid distillate is produced with a radionuclide concentration that is below the current discard limit and acceptable for discharge to the Radioactive Liquid Waste Treatment Facility.

iii Discard levels are determined through a LANL/DOE Plutonium Disposition Methodology, or by using existing DOE established discard limits.

iv These pencil tanks will become part of the PF-4, Room 401 storage tank system.

v Hazardous and mixed waste generated must be placed into a regulated waste storage area on a daily bases to be in compliance with 20 NMAC 4.1 requirements.

vi Incorporate the cost of waste management, cradle-to-grave, into a research project's total cost.

vii Waste typically is shipped and stored at TA-54's Solid Waste Operations until it is shipped off-site to a waste treatment or disposal facility.

viii Storage in an SAA is preferred over a less-than-90-day storage area or interim status storage unit. SAAs are easily created and or removed and have more flexibility for managing orphan waste.

ix Characterization of the waste should be initiated immediately to remain compliant with hazardous waste characterization regulations.

x Nonradioactive used oil is analyzed for flash point, arsenic, cadmium, chromium, lead, and total halogens, as specified in 40 CFR §279.11 requirements. Radioactive used oil is also analyzed for 40 CFR §261.24 toxicity characteristics, volatile organics, and semivolatile organics. All oils are also analysis for PCBs. LANL has also discovered an analytical detection problem when evaluating used oil for volatile organics and semivolatile organics compounds. The problem comes from failure to achieve detection limits for selected compounds below the required regulatory concentration limits for the organic maximum concentration of contaminants for the toxicity characteristic found in Table 1, of 40 CFR §261.24. This analytical detection limit concentration problem also carries over to some of the universal treatment standards for underlying hazardous constituents found in 40 CFR §268.48.

xi URL for DSSI is www.dssi-tn.com/dssiban.html.

xii M&EC Phone number (423) 425-1257.

xiii 20 NMAC 4.1, Subpart VIII and incorporating by reference 40 CFR §268.40.

xiv This spill kit is sold by JV Manufacturing Company, Inc. 1-800-334-9092.

xv The state of New Mexico has not adopted the more recent *Code of Federal Regulations*, Title 40, "Hazardous Waste Regulations," Parts 260-270, 273, and 279. CFR adoption is through January 1, 1997. Current 40 CFR Part 268 requirements do not require state notification for generator waste treatment activities.

xvi Scrap metal that contains a hazardous waste constituent, basically toxicity characteristic metals, are not managed as mixed waste until the scrap metal has been evaluated at the Decon Ops Facility, and it has been determined that decontamination is not possible.