U.S. DEPARTMENT OF
ENERGY

ESHID-603609

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Date: **NOV 3 0 2020**
Symbol: EPC-DO-20-329
LA-UR: 20-28226
Locates Action No.: Not applicable

Mr. Kevin Pierard, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6313

Subject: Transmittal of 2020 Hazardous Waste Minimization Report, Los Alamos National Laboratory, EPA ID# NM0890010515

Dear Mr. Pierard:

This letter transmits a report required by the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit (the Permit). The Permit authorizes the United States Department of Energy (DOE) and its field offices, the National Nuclear Security Administration Los Alamos Field Office (NA-LA), and the DOE - Environmental Management Los Alamos Field Office (EM-LA), along with Triad National Security, LLC (Triad), and Newport News Nuclear BWXT - Los Alamos, LLC (N3B) collectively, the Permittees, to manage, store, and treat hazardous waste at LANL. The report, as required by Permit Section 2.9, *Waste Minimization Program*, is submitted annually to the New Mexico Environment Department- Hazardous Waste Bureau (NMED-HWB) by December 1 for the previous fiscal year, ending September 30.

Enclosures 1 and 2, *2020 Los Alamos National Laboratory Hazardous Waste Minimization Report* drafted by NA-LA/Triad and EM-LA/N3B, respectively, satisfy the reporting requirements as outlined in Permit Section 2.9. Each enclosure also contains a signed certification from the responsible Co-Permittees.

If you have questions or comments concerning this submittal for Triad, please contact Karen E. Armijo (NA-LA) at (505) 665-7314 or Terence Foecke (Triad) at (505) 665-9822.

If you have questions or comments concerning this submittal for N3B, please contact Arturo Duran of the Department of Energy-Environmental Management (EM-LA) at (505) 257-7907 or Emily Day (N3B) at (505) 695-4243.

Sincerely,

Karen E. Armijo Digitally signed by Karen E. Armijo Date: 2020.11.24 13:21:05 -07'00'

Karen E. Armijo
Permitting and Compliance Program Manager
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy

Sincerely,

M Lee Bishop Digitally signed by M Lee Bishop Date: 2020.11.09 17:10:33 -07'00'

M. Lee Bishop, Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office
U.S. Department of Energy

Enclosure(s): 1) 2020 Los Alamos National Laboratory Hazardous Waste Minimization Report (NA-LA/Triad)

2) 2020 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC (EM-LA/N3B)

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Enclosures 1 and 2, *2020 Los Alamos National Laboratory Hazardous Waste Minimization Report* drafted by NA-LA/Triad and EM-LA/N3B, respectively, satisfy the reporting requirements as outlined in Permit Section 2.9. Each enclosure also contains a signed certification from the responsible Co-Permittees.

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ENCLOSURE 1

2020 Los Alamos National Laboratory Hazardous Waste Minimization Report (NA-LA/Triad)

EPC-DO: 20-329

LA-UR-20-28226

Date: NOV 3 0 2020

November 2020
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2020 Los Alamos National Laboratory Hazardous Waste Minimization Report

Author(s): *Environmental Protection and Compliance Division*

Intended for: *New Mexico Environment Department*

Los Alamos
NATIONAL LABORATORY
EST. 1943

Document: Hazardous Waste Minimization Report

Date: November 30, 2020

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JENNIFER PAYNE (Affiliate) Digitally signed by JENNIFER PAYNE (Affiliate) Date: 2020.11.20 14:07:53 -07'00'

24 November 2020

Jennifer E. Payne

Date Signed

Division Leader
Environmental Protection and Compliance
Triad National Security, LLC
Los Alamos National Laboratory
Operator

Karen E. Armijo Digitally signed by Karen E. Armijo Date: 2020.11.24 13:20:11 -07'00'

24 November 2020

Karen E. Armijo

Date Signed

Permitting and Compliance Program Manager
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy
Owner/Operator

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List of Acronyms

ABF	ammonium bifluoride
CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research facility
DOE	US Department of Energy
DOE-EM	US Department of Energy – Environmental Management
EPA	Environmental Protection Agency
EPC	Environmental Protection and Compliance
EPC-ES	Environmental Protection and Compliance-Environmental Stewardship
ESHQSS	Environment, Safety, Health, Quality, Safeguards, and Security
FY	fiscal year
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LED	light-emitting diode
LLW	low-level waste
MLLW	mixed low-level waste
MTRU	mixed transuranic waste
M^3	Cubic meters
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
New Gen	New Generation MLLW or MTRU wastes
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration

OS-OBS	Operations and Business Systems
PF4	Plutonium Facility
PCB	polychlorinated biphenyls
P2	Pollution Prevention
RAM	Resonant Acoustic Mixing
RCRA	Resource Conservation and Recovery Act
Sigma	Sigma Division at TA-03-0066 (basic/applied nuclear research)
TA	technical area
TRU	Transuranic
Triad	Triad National Security, LLC
TSFD	Treatment, Storage, and Disposal Facilities
TWF	Transuranic Waste Facility
WCATS	Waste Compliance and Tracking System
WCRRF	Waste Characterization, Reduction, and Repackaging Facility
WIPP	Waste Isolation Pilot Plant

1.0 Hazardous Waste Minimization Report

1.1 Introduction

Waste minimization and pollution prevention are goals for Los Alamos National Laboratory (LANL or the Laboratory) and are included in the operating procedures of Triad National Security, LLC (Triad). The U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) and Triad are required to submit an annual hazardous waste minimization report to the New Mexico Environment Department (NMED) in accordance with the Los Alamos National Laboratory Hazardous Waste Facility Permit. The following report was prepared pursuant to the requirements of the LANL Hazardous Waste Facility Permit Section 2.9 of and consists of information compiled during Triad operational control of the Laboratory. This report describes the hazardous waste minimization program for LANL, which is implemented by the Environmental Protection and Compliance (EPC) Division and the Pollution Prevention (P2) Program.

On April 30, 2018, Newport News Nuclear BWXT-Los Alamos, LLC (N3B) assumed responsibility for the Consent Order and legacy cleanup for Department of Energy – Environmental Management (DOE-EM) at LANL. N3B did not ship remediation waste offsite in fiscal year (FY) 2018. After April 30, 2018 N3B managed Consent Order activities including remediation waste and legacy cleanup responsibilities in FY 2019 and FY 2020.

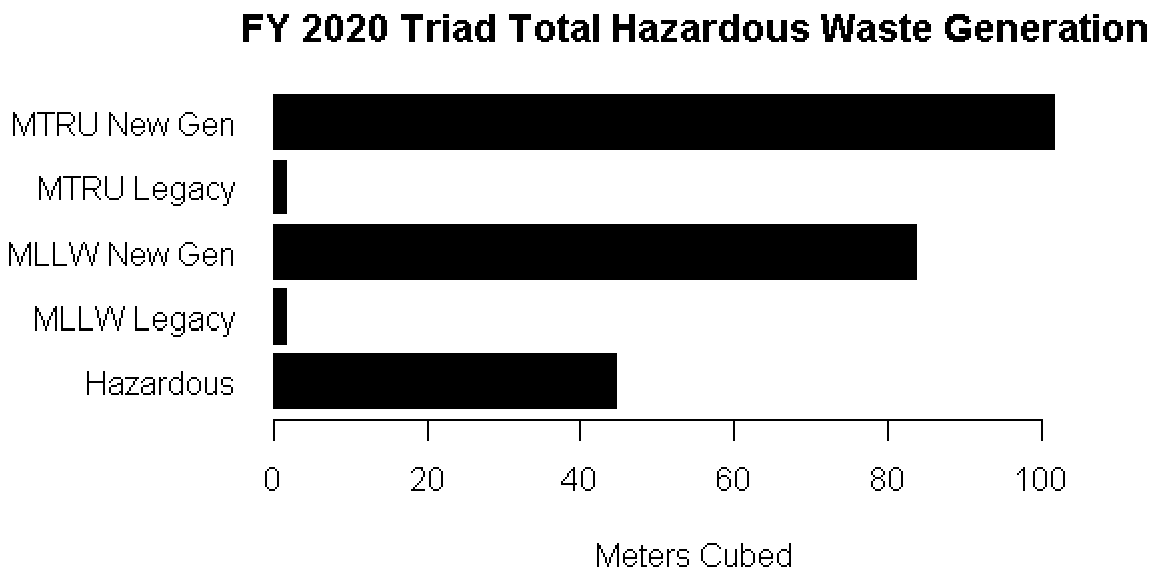
Triad is responsible for current or new generation mixed TRU waste (MTRU) generated at several sites at the Laboratory including the Chemistry and Metallurgy Research Facility (Technical Area (TA) 03 CMR) and TA-55 including the Plutonium Facility (TA-55 PF4), Triad is also the owner of some MTRU legacy waste containers; however, those containers are managed by N3B at TA-54 G. Triad is also responsible for new generation hazardous waste (HAZ) and mixed low level waste (MLLW); those wastes streams are generated at various facilities across the LANL complex. N3B manages Triad owned containers at TA-54 G and TA-54 L. During FY 2020, LANL compliantly shipped all Triad owned hazardous and MLLW containers out of TA-54 L.

Minimization of hazardous waste and tracking of hazardous waste generation continued in FY 2020. Projects, summarized later in this report, targeted minimization of hazardous waste as part of the planning process. In FY 2020, debris from TA-55 operating activities was a significant component of Triad's MTRU waste. For hazardous waste in FY 2020, waste from clean-out/clean-up activities generated the larger volumes. The Laboratory's waste minimization efforts and analysis of these waste streams are discussed in detail in this report.

Despite the novel coronavirus that curtailed on-site work, LANL shipped MTRU waste to the Waste Isolation Pilot Plant (WIPP) in FY 2020.

Table 1. Total MTRU, MLLW, and Hazardous Waste for Triad in FY 2020

MTRU Legacy and MLLW Legacy generation is owned by Triad but managed by N3B. New Gen indicates Triad current generation waste.



1.2 Purpose and Scope

The purpose of this report is to describe the implementation and maintenance of the waste minimization program at LANL to reduce the volume and toxicity of hazardous wastes generated, thereby minimizing potential threats to human health and the environment. This report discusses the main components of Hazardous Waste, MTRU, and MLLW for FY 2020 and the waste minimization efforts for those wastes. In addition, the report documents FY 2020 waste quantities processed in comparison with FY 2019 and compared the waste minimization efforts applied during those years.

1.3 Requirements of LANL's Hazardous Waste Facility Permit

As a permitted facility, LANL must fulfill operating permit requirements. According to Code of Federal Regulation 40 CFR § 264.73(b)(9), a certification process is required that demonstrates that LANL has a plan in place to reduce the volumes and toxicity of hazardous waste. LANL certifies its waste minimization program through this written document, which is submitted annually to the NMED in lieu of the Environmental Protection Agency (EPA).

The list of permit requirements below corresponds with the report sections of this report that address the requirement.

Table 2. LANL Hazardous Waste Facility Permit Section 2.9

Permit Requirement	Topic	Report Section
Section 2.9 (1)	Policy statement	Section 2.1
Section 2.9 (2)	Employee training and incentives	Section 2.2
Section 2.9 (3)	Past and planned source reduction and recycling	Sections 2.3.1, 3.4, 5.3
Section 2.9 (4)	Itemized capital expenditures	Section 2.3.1, 3.4
Section 2.9 (5)	Barriers to implementation	Sections 3.5, 4.3, 5.4
Section 2.9 (6)	Investigation of additional waste minimization efforts	Sections 2.3.1, 3.4, 5.3
Section 2.9 (7)	Waste stream flow charts, tables, and analyses	Sections 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 5.1, 5.2
Section 2.9 (8)	Justification of waste generation	Sections 2.4

The governing document for waste management at the Laboratory is P409. The figure below provides a flow chart of the waste management process. Due to the large amount of information provided in the chart, increase the zoom level to 250% or higher for better resolution.

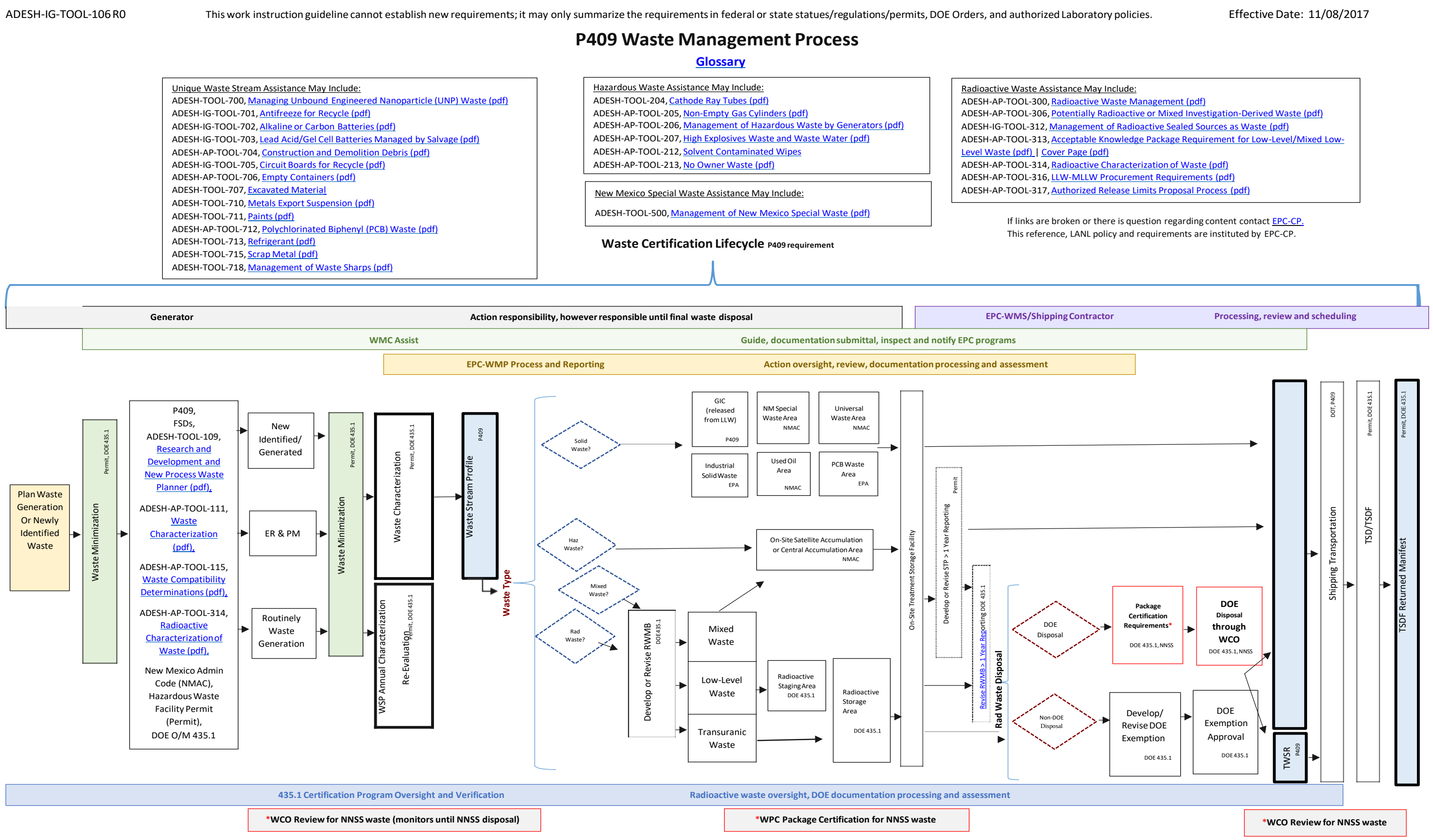


Figure 1. P409 Waste Management Process

2.0 Waste Minimization Elements

2.1 Governing Policy on Environment

LANL's Environmental Governing Policy states:

> *"We are committed to act as stewards of our environment to achieve our mission in accordance with all applicable environmental requirements. We set continual improvement objectives and targets, measure and document our progress, and share our results with our workforce, sponsors, and public. We reduce our environmental risk through legacy cleanup, pollution prevention, and long-term sustainability programs."*

Regulatory drivers for waste minimization include the Resource Conservation and Recovery Act (RCRA), the Pollution Prevention Act of 1990, the Code of Federal Regulations (CFR), Title 40, Parts 260–280, and the ISO 14001 Standard for the Laboratory's Environmental Management System.

2.2 Employee Training and Incentive Programs

Several employee training and incentive programs exist to identify and implement opportunities for recycling, pollution prevention, sustainability, waste minimization, and source reduction of various waste types.

Training courses that address waste minimization and pollution prevention requirements include:

- General employee training,
- Waste generator overview,
- Radworker II,
- LANL and McCoy RCRA personnel training, and
- Environmental Management System awareness training.

The Laboratory, DOE, and NNSA sponsor annual sustainability award competitions. The awards recognize personnel who implement pollution prevention projects. In FY 2020, the P2 Program managed a LANL environmental awards program that emphasized source reduction of all types of waste. The award winners were recognized by the senior manager from Environment, Safety, Health, Quality, Safeguards, and Security (ESHQSS), Michael Hazen, with a certificate and a small cash award, which serve as incentives for participation in future years. The gold level winners were also recognized by the Laboratory director, Thom Mason, during the LANL 2020 Awards Night.

2.3 Investigation of Additional Waste Minimization and Pollution Prevention Efforts

The Laboratory's P2 Program monitors waste trends and works with other programs to develop process improvement projects. In addition, the P2 Program provides financial analysis support for these projects to better understand the return on investment. Project ideas often come directly from researchers, waste management coordinators, and the P2 Program staff. Since project ideas come from different sources with different levels of P2 expertise, the program makes support decisions after a comparative ranking using scoring criteria that emphasize source reduction, return on investment, transferability, and waste minimization that support the LANL mission.

2.3.1 Funding for Projects

The following paragraphs describe recent P2 projects and capital funding. P2 projects implemented at the Laboratory address all types of waste and pollutants. However, the following list includes projects designed to reduce hazardous waste, MLLW, or MTRU. Projects that address other waste types are not described in this report.

In FY 2020, pollution prevention funds were allocated to the following project:

- New Solvent less Nitration Methods ($102,000)

  Scientists are experimenting with solid-state chemistry using planetary ball milling to address the hazardous waste generated by traditional concentrated acid wet chemistry for high explosive processes. Research into this method will continue in FY 2021 as scale-up can lead to reduced disposal and purchase costs associated with the concentrated acids. In addition, workers in high explosives will benefit from being exposed to less hazardous chemicals.

During the FY 2020 budgeting process, the P2 Program allocated funds to three projects for FY 2021 that aim to reduce hazardous waste:

- Continuation of the project New Solvent less Nitration Methods ($148,000),
- Copper Bioleaching to eliminate nitric acid waste for target development used in plasma physics experiments ($50,000), and
- Development of Resonant Acoustic Mixing (RAM) in explosives processing to eliminate hazardous solvent waste ($54,500).

In FY 2019, pollution prevention funds were allocated to the following project:

- Dissolving Post-Detonation Debris with Ammonium Bifluoride (ABF) and diluted Nitric Acid ($45,000)

  Based on FY 2017 and FY 2018 results, showing that ABF is a viable alternative to strong acids for quick dissolution of glass materials for nuclear forensic analysis, in FY 2019 actinide analytical chemists tested the ABF glass material dissolution to synthetic post-detonation debris studied widely in the nuclear forensic world. Results indicate ABF is capable of synthetic post-detonation debris dissolution. Next steps would be to test the

ABF process on live nuclear forensic samples. Due to funding constraints, this project was not continued into FY 2020 or FY 2021.

2.4 Utilization and Justification for the Use of Hazardous Materials

LANL is a research and development facility that executes thousands of experiments requiring the use of chemicals or materials that may create hazardous waste. Pollution prevention and waste minimization requirements for waste generators include source reduction and material substitution techniques through process improvements and best management practices. However, customer requirements, project specifications, validated protocols, or the nature of the research may demand the use of specific chemicals that are hazardous.

To encourage the use of nontoxic or less hazardous substitutes whenever possible, the P2 Program staff help LANL workers to identify the least toxic chemicals that have the desired characteristics for his or her particular project using waste process and input alternative analysis.

3.0 Hazardous Waste

3.1 Introduction

The reported annual hazardous waste quantity is based on the total amount of waste by volume recorded in LANL's Waste Compliance and Tracking System (WCATS) database. A query regarding information about specific wastes is entered into WCATS using waste stream numbers. This report does not include waste quantities generated prior to onsite treatment, which is why waste quantities do not match those reported in LANL's biennial report. Additionally, this report uses FY data, and the biennial report uses calendar year data. The WCATS data used in this report was collected for FY 2020 on Nov 18, 2020.

In brief, 40 CFR §261.3, as adopted by the NMED as 20.4.1.200 NMAC, defines hazardous waste as any solid waste that:

- is not specifically excluded from the regulations as hazardous waste,
- is listed in the regulations as a hazardous waste,
- exhibits any of the defined characteristics of hazardous waste (i.e., ignitability, corrosiveness, reactivity, or toxicity),
- is a mixture of solid and hazardous wastes, or
- is a used oil having more than 1,000 ppm of total halogens.

3.2 Hazardous Waste Minimization Performance

The amount of non-remediation hazardous waste generated at LANL in FY 2020 was 44.5 m^3 compared to 58.2 m^3 of hazardous waste generated in FY 2019. These waste stream volumes are primarily due to clean-out/clean-up activities. All of the hazardous waste processed from

LANL in FY 2020 and FY 2019 are shown below and sorted by the amount of waste originating in each TA, and further sorted for FY 2020 to show the quantity of waste generated from highest to lowest.

Table 3. Generation of Hazardous Waste by Technical Area during FY 2019 and FY 2020; FY 2020 ranked by volume

Technical Area (TA)	FY 2019 Hazardous Waste (M^3)	FY 2020 Hazardous Waste (M^3)
3	13.77	19.64
35	22.2	6.26
16	1.96	5.25
09	-	4.55
46	3.6	2.96
48	0.29	2.51
15	0.11	1.17
60	0.79	0.48
59	0.7	0.43
55	0.34	0.37
22	10.1	0.21
08	0.45	0.21
36	0.26	0.21
53	-	0.19
40	0.18	0.056

3.3 Waste Stream Analysis

Commonly generated hazardous waste includes many types of research chemicals, solvents, acids, bases, carcinogens, compressed gases, metals, and other solid waste contaminated with hazardous material. Hazardous waste may include equipment, containers, structures, and other items intended for disposal that are considered hazardous (e.g., compressed gas cylinders). Some waste waters that cannot be sent to the sanitary waste water system or to the high explosives waste water treatment plant may also qualify as hazardous waste. After material is declared a waste, the hazardous waste is characterized, labeled, and collected in appropriate storage areas. The waste is ultimately shipped to offsite RCRA Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs) for final treatment or disposal. Some hazardous wastes can be recycled. These include aerosol cans, light bulbs, batteries, mercury, and ferric chloride solution.

The largest non-recyclable hazardous waste streams are described in this section. High explosives waste is treated onsite and is excluded from the analysis.

Unused/Unspent Chemicals: The volume of unused and unspent chemicals varies each year. Researchers are encouraged not to buy more of any chemical than they are certain to need for several months to avoid having any unused amount. Researchers are also encouraged to share chemicals among multiple users when possible.

Solvents: EPA-listed and characteristic solvents and solvent-water mixtures are used widely in research, maintenance, and production operations, especially for cleaning and extraction. Nontoxic replacements for solvents are used whenever possible. New procedures are also adopted, where possible, that either require less solvent than before, or eliminate the need for solvent altogether. However, solvents are still required for many procedures, and solvents persist as a large component of the hazardous waste stream.

Acids and Bases: A variety of strong acids and bases are routinely used in research, testing, and production operations. Over the past decade, the overall volume of hazardous acid and base waste has been reduced mainly by using new procedures that require less acid or base, by recycling acids onsite for internal reuse, and by reusing spent acids and bases as part of established neutralization procedures onsite.

Hazardous Solids: This waste stream includes inert barium simulants used in high explosives research, electronics, contaminated equipment, broken leaded glass, firing site debris, ash, and various solid chemical residues from experiments. Metals can also be a hazardous solid waste such as lead and copper.

Hazardous Liquids: This waste stream is primarily aqueous, neutral liquids that are generated from a variety of analytical chemistry procedures. This waste stream also includes aqueous waste from chemical synthesis, spent photochemicals, electroplating solutions, refrigerant oil, and ethylene glycol.

Laboratory Trash and Spill Cleanup: Laboratory trash mostly consists of paper towels, pipettes, personal protective equipment, and disposable lab supplies. Rags are used for cleaning parts, equipment, and various spills. Equipment improvements have reduced the number of oil spills from heavy equipment, and new cleaning technologies have eliminated some processes where manual cleaning with rags was required in the past.

FY 2020 Hazardous Waste

Table 4. Constituents of Hazardous Waste in FY 2020

Waste Stream Number	Volume (m^3)	% Total	Waste Description
48549	4.3	9.7	PCB Oil from Sigma Clean-out Project
46773	4.0	9.0	Beryllium debris waste from switch

Waste Stream Number	Volume (m^3)	% Total	Waste Description
			replacement at TA-35 capacitor bank
48461	3.8	8.5	Removal of pipe wrapped in asbestos painted with lead paint at TA-09
Various	32.4	72.8	Consistent with waste streams described in **Section 3.3**

FY19 Hazardous Waste

The largest component of hazardous waste was Peel Away 7 Paint Removal representing 26.3% (15.29 m^3 out of 58.2 m^3) of hazardous waste generation in FY 2019. The waste stream number in WCATS is 47155. Peel Away 7 was applied to remove lead paint from a floor. Once applied, it was covered with plastic and allowed to dry; it bonded to existing paint. Once dried, the plastic containing Peel Away 7 and paint was rolled up and disposed of as hazardous waste. Since the process did not work as well as anticipated, this is a one-time hazardous waste stream.

The second largest component consisted of spent ferric chloride (pH < 2) from rinsing and draining of the etching machine at TA-22. It represents 9.6 percent of the total (5.6 m^3 out of 58.2 m^3 hazardous waste).

The remaining hazardous waste consisted of small by volume waste streams and are consistent with **Section 3.3.**

3.4 Hazardous Waste Minimization and Operational Funding

Starting in FY 2011, special recycling operations were established in TA-60-86 at LANL. Spent bulbs, aerosol cans, and batteries are collected from various sites and brought to TA-60 for empty aerosol cans to be punctured, used bulbs to be packaged together, and batteries to be packaged for recycling. Consolidating these operations at one location is cost effective and maximizes recycling potential. In regards to lead acid battery recycling, this component of the recycling waste stream is managed by salvage at LANL.

Table 5. Universal Waste Recycled at LANL in FY 2020 and FY 2019

Universal Waste Type	FY 2020	FY 2019
Aerosol cans (m^3)	2.9	2.42

Universal Waste Type	FY 2020	FY 2019
Lamps/Bulbs/Tubes (m^3)	20.89	21.77
Batteries (m^3)	0.882	0.81
Total Volume (m^3)	**24.67**	**25.0**
Total Cost	**$7,379**	**$7,477.5**

Total cost in the above table is based on recycle invoice dollar amount and volume of shipment on invoice. The invoice payment is $4,802.35. The volume of the material on the invoice is 16.0557 m^3. Therefore, the unit cost is $4,802.35 divided by 16.0557 m^3 = $299.1/ m^3. This unit cost number is then multiplied by FY 2018 and FY 2019 total volume (m^3) to get the total cost for each year.

Solvent Waste Reduction and Recycling

At LANL, many projects are implemented to reduce the use of solvents because they are a common component of the hazardous waste stream; some of these projects are described below.

- Two laboratories in LANL's Bioscience Division installed solvent recovery systems for acetonitrile in high performance liquid chromatography waste. These systems prevent the generation of about 0.4 m^3 of hazardous waste solvents per week.
- In FY 2018, P2 funding was used to purchase a solvent evaporator to reduce hazardous hexane solvent exhaust, and to be able to reuse captured hexane solvent for one reuse when processing waste water samples. During "in-house" PCB analysis of waste waters, the solvent evaporator reduces consumption of the hazardous hexane solvent per PCB sample processed.

During the FY 2020 budget process for the P2 Program, funds have been allocated to a project that aims to reduce solvent waste for FY 2021. **See Section 2.3.1.**

Acids and Bases Reduction

In FY 2020, the P2 Program funded high explosive scientists to experiment with a planetary ball mill process to avoid traditional concentrated acid wet chemistry. This solid-state chemistry approach, if deemed successful, will avoid the high amount of concentrated acids used in nitrations for current high explosive processes. To demonstrate the importance of developing a planetary ball milling process for acid waste reduction, the P2 Program will continue to fund this project in FY 2021.

During the FY 2020 budget process for the P2 Program, funds have been allocated to an additional project related to copper bioleaching that aims to reduce acid waste for FY 2021. **See Section 2.3.1.**

Unused/Unspent Chemical Waste Reduction

Unused and unspent chemical waste is waste stream LANL is trying to reduce. For example, in FY 2020, LANL lab packed 1,780 items under the unused/unspent chemicals waste profile. Laboratory packed items tend to be small and are first packaged in small containers and then placed into large drums in which voids are filled with benign absorbent material. For that reason, this waste stream does not stand out when analyzing waste by volume.

The LANL Chemical Management Program was transferred to the Environmental Stewardship Group (EPC-ES) in TA-00-0795 from Operations and Business Systems (OS-OBS) in order to take a lifecycle management approach to chemicals from pre-purchase screening through efficient use and effective inventory practices to establishing a path to disposal. In FY 2020, the P2 Program devoted significant staff resources to analyze the site-wide Chemical Management Program and overall chemical usage for source reduction opportunities. This effort identified three areas of concern: pre-procurement review of chemicals, chemical ordering practices, and inventory management.

An enhanced chemical management program staffed with chemical purchasing and inventory specialists is being developed and will serve as a central source of information and analyses for chemical management at LANL. The program will institute structural changes that will reduce quantities of unused/unspent chemicals requiring management as hazardous waste, accelerate adoption of safer alternatives, and improve worker health and safety.

3.5 Barriers to Hazardous Waste Minimization

LANL has a long history of successful waste minimization. However, the next stage of waste minimization will require more research, investment, and time to accomplish than in past efforts. This is because the remaining hazardous wastes, if they can be minimized, will require changes to core processes rather than support processes, which is always a difficult undertaking in a research and laboratory environment. In the future, every waste minimization project will be unique and require innovation to enhance LANL's mission and that will require researcher engagement. Early integration of P2 strategies into program and project design and lifecycle planning is LANL's approach going forward.

4.0 Mixed Transuranic Waste

4.1 Legacy and Current MTRU

MTRU contains hazardous constituents in addition to high levels of radiation. As of FY 2016, there were over 5,000 legacy waste containers at TA-54 G (2,400 transuranic waste containers). The majority of these containers were generated in the 1970's, 1980's, and early 1990's which is in some cases prior to the enactment of RCRA and in all cases prior to the implementation of a strong waste profiling program at LANL. In the mid 1990's, LANL implemented a requirement that a waste profile be developed for all waste generated to comply with RCRA requirements. DOE-EM took ownership of TA-54 in May 2018, and N3B became responsible for legacy MTRU disposition in May 2018, but did not ship waste in FY 2018. In FY 2019 and FY 2020, on behalf of DOE-EM, N3B shipped MTRU waste.

In general, the legacy waste is owned and managed by N3B. However, some containers, although managed by N3B, are in fact owned by Triad. Triad generated 5.63 m^3 of this legacy MTRU in FY 2020, and this waste is associated with debris from repackaging efforts.

In addition to the Triad owned legacy waste, Triad is a current generator of MTRU waste and ships this waste to WIPP. Triad generated a total of 101.6 m^3 of MTRU. The generating facilities are TA-55, TA-55 PF4 and TA-03 CMR. TA-55 PF4 generated waste associated with debris (such as metals, rags, paper, and plastics) from the following operations within the facility: chloride, metal, nitrite, Plutonium-238, and pyrochemical processes. TA-55 generated MTRU from the same waste stream. In addition, TA-03 CMR generates MTRU, and this new generation waste stream is associated with material from clean-out of containment vessels used in high explosive operations. The waste includes shot mitigation materials, such as ash, metal pieces, rebar, vermiculite, and concrete. For Fiscal Year 2019, Triad's MTRU generation consisted of similar waste streams but totaled 55.3 m^3 of waste.

4.2 Waste Stream Analysis

Legacy Waste

To categorize the legacy waste at TA-54, new waste profiles were created. These are:

- Remediated nitrate salts mixed inorganics,
- Mixed inorganic waste from TA-55,
- Cemented waste (with liquids) from TA-55,
- Cemented waste from TA-55,
- Mixed heterogeneous debris waste,
- Mixed heterogeneous debris waste,
- Cemented waste from TA-50 (rad liquid waste),
- Sludge waste from TA-50 (rad liquid waste),
- Mixed inorganics from TA-55, and
- Cemented waste from CMR.

The table below shows legacy waste generation associated with containers owned by Triad but managed by N3B.

Table 6. Fiscal Year 2020 Triad MTRU Legacy Summary

Waste Stream Number	Volume (m^3)	Generation	Waste Minimization	Disposal Facility
42617	5.63	Debris from repackaging	Difficult to minimize since legacy waste has already been generated	WIPP

The table below lists the MTRU current generation from TA-55, TA-55 PF4, and TA-03 CMR; the Triad facilities responsible for new generation waste. These wastes are at LANL and awaiting to be shipped to WIPP.

Table 7. Fiscal Year 2020 Triad MTRU Current Generation

Waste Stream Number	Volume m^3	Percent Total	Generating Facility	Waste Description
46457 **46633,46634**	6.04	5.9	TA-55 PF4	Debris wastes from Plutonium Facility Operations
46457,46458 **46633,46634, 47746, 47833, 47861**	85.98	84.6	TA-55	Debris wastes from Plutonium Facility Operations
46607	8.7	8.5	TA-03 CMR	New generation waste from clean-out of legacy high explosive containment vessels
48709	0.83	0.8	TA-03 CMR	Debris waste from footprint reduction activities

4.3 Barriers to MTRU Waste Minimization

A majority of MTRU generation at LANL consists of legacy waste and falls under the responsibility of N3B and DOE-EM. This waste type is already generated and cannot be minimized in an efficient and cost effective manner. In fact, legacy waste disposal often involves increasing waste volumes since historical parent containers are repackaged into daughter containers (e.g., one parent container can turn into two or three daughter containers) to safely dispose of the waste. This increases the number of drums shipped for disposal. It also leads to more debris waste from the repackaging activities.

Operations at TA-55 PF4 are in the process of implementing waste minimization strategies. These include limitations on material inputs into PF4 and glove boxes and implementation of purchasing and inventory controls on tools, materials, and chemicals introduced into glove boxes. Other strategies include purchasing longer life span materials and avoiding disposal of serviceable instruments such as balances and ovens. In FY 2020, safety protocol requirements, due to the novel coronavirus, interrupted many of these waste minimization plans.

5.0 Mixed Low-Level Waste

5.1 Legacy and Current MLLW

MLLW contains hazardous constituents in addition to low levels of radiation. As of January 2016, there were over 2,600 low-level waste (LLW) and MLLW legacy waste drums. During repackaging of legacy waste containers into daughter drums, debris waste is generated and characterized as MLLW. In some instances, debris from repackaging activities can be reclassified from MTRU to MLLW. In FY 2020, Triad owned, but N3B managed, MLLW legacy waste totaled 1.59 m^3 represented by debris from repackaging activities. These Triad owned containers are managed at TA-54 G.

A significant Triad current generation MLLW stream comes from demolition of the TA-46 Building 001, Electronics Laboratory. The waste stream contains hazardous materials in the piping. Another significant component from Triad's MLLW current generation in FY 2020 consists of waste from clean-out and upgrade operations at TA-03-0066 (Sigma). In 2019, waste clean-up activities at TA-53 was a significant MLLW stream. In summary, Triad generated 83.71 m^3 of MLLW new generation waste for FY 2020. For FY 2019, Triad generated 51.89 m^3 of MLLW.

MLLW by Location during FY 2019 and FY 2020

Table 8. Generation of MLLW by Technical Area during FY 2019 and FY 2020; FY 2020 ranked by volume

Technical Area (TA)	FY 2019 MLLW (m^3)	FY 2020 MLLW (m^3)
03	17.08	37.48

Technical Area (TA)	FY 2019 MLLW (m^3)	FY 2020 MLLW (m^3)
55	2.5	18.9
46	-	17.8
48	5.68	8.7
21	-	0.62
35	2.54	0.10
53	23.99	0.075

5.2 Waste Stream Analysis

The section describes legacy and current MLLW generation for Fiscal Year 2020 owned by Triad. The legacy waste stream is associated with debris from repackaging activities while the new generation waste streams are associated with demolition activities at TA-46 and with clean-up activities at TA-0066 (Sigma).

Table 9. Fiscal Year 2020 Triad MLLW Legacy Summary

Waste Stream Number	Volume (m^3)	Generation	Waste Minimization	Disposal Facility
46967	1.59	Debris from repackaging	Difficult to minimize since legacy waste has already been generated	Private mixed waste treatment company

Table 10. Fiscal Year 2020 Triad MLLW Current Generation

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
48698	17.8	21.3	TA-46	Waste from demolition activities
47301	15.3	18.2	TA-03-0066 (Sigma)	Equipment removal waste for electrochemistry operations upgrade
47464/48427	10.0	11.9	TA-03-0066 (Sigma)	P Area clean-out operations

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
Various	40.61	48.6	Triad Facilities	Small volume MLLW waste streams

5.3 Mixed Low-Level Waste Minimization

LANL is working on projects to reduce MLLW:

- At TA-53 (LANSCE), millions of pounds of metals are ready to be dispositioned. However, due to the nature of the work at LANSCE, some of these metals are potentially activated with radiation. Although not the case for all the metals, some can contain hazardous constituents making them a MLLW waste stream as opposed to a LLW waste stream. A team at LANL is working to analyze these metals to determine radiation levels. If determined to not be activated, the metals can be recycled as opposed to shipped off as LLW or MLLW. In FY 2019, 1.5 million pounds of metal was recycled. Due to the COVID-19 pandemic, only 20,000 pounds of metal was recycled in FY 2020. However, this project will be continued in FY 2021 and can serve as a mechanism for MLLW avoidance.

- One effort involved replacing traditional fluorescent fixtures with light-emitting diode (LED) fixtures in gloveboxes. The LEDs are much smaller and lighter than fluorescents, and the LEDs last longer, use less electricity, and generate less heat than fluorescents. Since they last longer, they ultimately generate less waste. From FY 2008 through FY 2018, groups at TA-55 and TA-48 purchased more LED lights for gloveboxes, and future plans are to expand the use of LED lights in radiological areas across LANL.

5.4 Barriers to MLLW Minimization

In many instances, MLLW minimization is difficult to implement because it requires procedural changes. This process can take multiple years since safety for personnel and efficacy of a new process must be ensured. Due to the novel coronavirus, any process changes have slowed even further. In addition, since certain processes are already in place the waste minimization change may not be cost effective.

6.0 Remediation Waste

The scope of environmental remediation activities has been under the Los Alamos Legacy Cleanup Contractor, N3B, on behalf of DOE-EM's Los Alamos Field Office since May 2018.

ENCLOSURE 2

2020 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC (EM-LA/N3B)

EPC-DO: 20-329

LA-UR-20-28226

Date: NOV 3 0 2020

November 2020
EM2020-0576

2020 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC

Los Alamos National Laboratory Hazardous Waste Facility Permit

CERTIFICATION

NEWPORT NEWS NUCLEAR BWXT-LOS ALAMOS, LLC

2020 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC

CERTIFICATION STATEMENT OF AUTHORIZATION

In accordance with the New Mexico Administrative Code Title 20, Chapter 4, Part 1 (incorporating the Code of Federal Regulations, Title 40 CFR § 270.11):

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

October 30, 2020

Joseph Murdock, Program Manager
Environment, Safety and Health
Newport News Nuclear BWXT-Los Alamos, LLC

Date

M Lee Bishop Digitally signed by M Lee Bishop
Date: 2020.11.03 12:12:45 -07'00'

M. Lee Bishop, Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office

Date

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1.0 HAZARDOUS WASTE MINIMIZATION REPORT

1.1 Introduction

Hazardous waste minimization and pollution prevention are incorporated as much as possible into operating procedures for the U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office (EM-LA) and Newport News Nuclear BWXT-Los Alamos, LLC (N3B). EM-LA and N3B are required to submit an annual hazardous waste minimization report to the New Mexico Environment Department (NMED) in accordance with the Los Alamos National Laboratory (LANL or the Laboratory) Hazardous Waste Facility Permit, Section 2.9. This report describes the N3B Hazardous Waste Minimization Program, which is a component of the Environmental Management System (EMS) administered by the Environment, Safety and Health (ES&H) Program. This report also describes the Permittees' pollution prevention goals for N3B's operations for FY 2021. N3B is the contractor selected to support EM-LA's mission work. The Los Alamos Legacy Cleanup Contract encompasses ongoing disposition of aboveground stored legacy transuranic (TRU) waste; groundwater and surface water monitoring and protection programs; groundwater contaminant plume investigation and evaluation for hexavalent chromium and high-explosives contamination; aggregate area investigations and remediation activities; and facility decontamination, decommissioning, and demolition (DD&D) activities.

Fiscal year (FY) 2020, when referred to in this document, spans the 12 months from October 1, 2019, through September 30, 2020. FY 2021 spans the 12 months from October 1, 2020, through September 30, 2021.

During FY 2020, N3B conducted hazardous waste minimization and pollution prevention efforts and shipped hazardous, mixed-transuranic (MTRU) waste, and mixed low-level (MLLW) remediation waste off-site in FY 2020. N3B's FY 2020 accomplishments and analysis of the waste streams are discussed in the following sections.

Because of a public health order issued on March 23, 2020, in response to the COVID-19 pandemic by the New Mexico Department of Health, as well as a partial stop-work order issued by DOE, EM-LA and N3B transitioned to essential mission critical activity (EMCA) status on March 24, 2020. This action limited facility operations to those considered EMCA.

1.2 Background

The 1990 Pollution Prevention Act changed the focus of environmental policy from "end-of-pipe" regulation to source reduction and waste generation minimization. Under the provisions of the Resource Conservation and Recovery Act (RCRA), and in compliance with the Pollution Prevention Act of 1990 and other institutional requirements for treatment, storage, and disposal of wastes, all waste generators must certify that they have a waste minimization program in place.

Specific DOE pollution prevention requirements are found in DOE Order 436.1, "Departmental Sustainability." The order contains goals for reduction of greenhouse gas emissions and conservation of energy and water and places a strong emphasis on pollution prevention and sustainable acquisition. DOE Order 436.1 requirements are executed through N3B's EMS.

1.3 Purpose and Scope

This report describes the Hazardous Waste Minimization Program that N3B has implemented to reduce the volume and toxicity of hazardous wastes generated in order to minimize the threat to human health and the environment. This report also discusses methods and activities to prevent or reduce hazardous waste generation and documents hazardous waste minimization efforts made in FY 2020. In most cases, hazardous waste minimization activities that were executed during FY 2020 will continue during FY 2021 and be developed into a robust program. This report also describes N3B's commitment to pollution prevention, its efforts to prevent pollution, and the barriers to implementing preventive efforts. The report categorizes waste minimization information by the following waste types: hazardous waste, MTRU waste, MLLW, and remediation wastes.

1.4 Operating Permit Requirements

Section 2.9 of the LANL Hazardous Waste Facility Permit requires that a waste minimization program be in place and that a certified progress report be submitted annually to NMED. The permit requirements listed in Table 1.4-1 correspond with the section(s) of this report that address each requirement. Changes from the previous year are noted throughout the report.

Table 1.4-1
LANL Hazardous Waste Facility Permit, Section 2.9

Permit Requirement	Item	Report Section
Section 2.9 (1)	Policy Statement	Section 2.1
Section 2.9 (2)	Employee Training and Incentives	Section 2.2
Section 2.9 (3)	Past and Planned Source Reduction and Recycling	Sections 2.4, 3.3, 4.3, 5.3, 6.3, and 6.4
Section 2.9 (4)	Itemized Capital Expenditures	Section 2.5
Section 2.9 (5)	Barriers to Implementation	Sections 3.4, 4.4, 5.4, and 6.5
Section 2.9 (6)	Investigation of Additional Waste Minimization Efforts	Section 2.4
Section 2.9 (7)	Waste Stream Flow Charts, Tables, and Analysis	Sections 3.2, 4.2, 5.2, and 6.2
Section 2.9 (8)	Justification of Waste Generation	Section 2.3

1.5 Organizational Structure and Staff Responsibilities

The ES&H Program has oversight of, and primary responsibility for, hazardous waste, air, and water quality, and corrective actions governed by the 2016 Compliance Order on Consent (Consent Order).

The ES&H Program has developed and is currently managing the EMS, which includes the Pollution Prevention Program. The EMS establishes (1) institutional waste minimization and pollution prevention objectives and targets and (2) environmental action plans that contain waste minimization, pollution prevention, and other environmental improvement actions.

The Contact-Handled Transuranic Waste (CH-TRU) Program provides all waste packaging, transporting, and disposal services for N3B. The Environmental Remediation (ER) Program cleans up legacy contaminated sites on and around the Laboratory. The cleanup is conducted under the Consent Order.

2.0 WASTE MINIMIZATION PROGRAM ELEMENTS

2.1 Governing Policy on Environment

N3B EMS policy N3B-SD400, “Environmental Management System,” addresses the Pollution Prevention and Site Sustainability Programs. As required by DOE Order 436.1, “Departmental Sustainability,” the EMS provides the framework for integration of sustainability and pollution prevention goals. N3B developed environment goals and objectives as part of the FY 2020 EMS. Of the 27 objectives identified by the EMS Integrated Project Team (IPT), 20 were fully implemented. The 27 goals were grouped under five overarching goals:

1. Establish a culture of sustainability among N3B employees and subcontractors.
2. Reduce waste from field activities.
3. Reduce waste from office and support activities.
4. Reduce energy consumption, greenhouse gas emissions, and natural resource consumption.
5. Manage and remove waste in support of lab operations and legacy waste remediation.

The following objectives, which are associated with these goals, support N3B’s overall waste minimization strategy:

- Goal 1, Objective 6 – Utilize EMS training to educate employees on individual contributions to EMS goals.
- Goal 2, Objective 1 – Institute a battery-recycling program for the 500+ batteries in the field by the Surface Water Program.
- Goal 2, Objective 2 – Institute a bottle-recycling program for the 3500+ bottles in the field used by the Surface Water Program.
- Goal 2, Objective 3 – Institute a glove-recycling program for the 150+ samples collected and processed each year used by the Surface Water Program.
- Goal 2, Objective 5 – Set up easily accessible, and clearly labeled recycling receptacles throughout Technical Area 21 (TA-21).
- Goal 3, Objective 1 – Place recycling centers for paper, cardboard, plastic, and aluminum cans in administrative buildings at TA-54.
- Goal 4, Objective 4 – Institute solar power for the 20 Sandia Canyon alluvial wells, replacing 350 D batteries/year.
- Goal 5, Objective 1 – Minimize LLW or MLLW through efforts such as: segregating construction and demolition waste from regulated waste (trailer demolition), sampling waste for classification before shipping for disposal (e.g. dome fabric).
- Goal 5, Objective 3 – Sort, segregate, treat, and package as necessary, legacy suspect transuranic waste per performance-based incentive (PBI) #20-001 and PBI #20-002
- Goal 5, Objective 4 – Meet CH-TRU MLLW shipment goals for FY2020 per PBI #20-008.

The EMS IPT is composed of professionals from across N3B functional areas to ensure that the environmental objectives and targets are integrated to foster a systematic approach to organizational sustainability initiatives. This group met monthly in the first half of FY 2020 to track the goals and objectives they developed, which were approved by N3B senior management in January 2020.

EMCA status and the related work restrictions interfered with the IPT and program implementation between March 24 and October 1, 2020. The EMS IPT is currently initiating a self-assessment of program effectiveness and will conduct a management assessment with N3B senior staff in November 2020 to pursue continual improvement of environmental protection initiatives in FY 2021.

2.2 Employee Training and Incentive Programs

N3B is developing training and incentive programs to identify and implement opportunities for waste recycling and source reduction. To date, these trainings include the EMS bi-annual training that is required for all N3B employees and the trainings associated with N3B-P409-1, “N3B Waste Management” (Course #23263, Waste Generation Overview-Live; Course #21464, Waste Generation Overview Refresher; Course #8504, WCATS: Waste Documentation).

2.3 Hazardous Materials Use and Justification

N3B is the contractor selected to support EM-LA’s mission work. This work encompasses ongoing disposition of legacy MTRU waste stored aboveground; monitoring and protection of ground and surface water; investigation and evaluation of groundwater contaminant plumes including hexavalent chromium and high explosives; multi-campaign investigations and remediation of soils including below-grade recoverable/remediation wastes; and DD&D of facilities.

The use of hazardous materials and generation of new hazardous wastes are minimal. The majority of hazardous wastes associated with this contract are investigation/remediation wastes and shipment of existing Federal Facility Compliance Order (FFCO) site treatment plan (STP) wastes to final disposition.

2.4 Investigation of Additional Hazardous Waste Minimization and Pollution Prevention Efforts

In FY 2020, N3B utilized its EMS to address hazardous waste minimization and pollution prevention efforts. The EMS fully met 74% of its objectives and made progress on the remaining 26%, but was unable to complete those entirely due to the EMCA status. This program is now fully mature, but continued improvements and enhancements are planned for FY 2021 in support of waste minimization.

2.5 Itemized Capital Expenditures

During FY 2020, capital expenditures and operating costs devoted to source reduction and recycling of hazardous waste were minimal. Because N3B typically generates very little, if any, new hazardous waste, there is nothing to report for FY 2020.

3.0 HAZARDOUS WASTE

3.1 Introduction

Hazardous wastes commonly generated, or which may be generated in the future, include solvents, metals, and other solid waste contaminated with hazardous waste constituents or expired/off-spec hazardous material. This waste may include equipment, containers, structures, and other items intended for disposal, including such items that are contaminated with hazardous constituents, as well as other wastes resulting from DD&D and maintenance activities. Potentially generated contaminated wastewaters may be considered hazardous waste. Recycled wastes may include lightbulbs, batteries, and mercury.

3.2 Waste Stream Analysis

Hazardous waste is generated from hazardous materials and chemicals, hazardous materials disposed of as part of equipment replacement or facility decommissioning, and water contaminated with hazardous materials. After material is declared waste, the hazardous waste is characterized, labeled, and collected in appropriate storage areas. The waste is ultimately shipped to off-site treatment, storage, and disposal facilities for final treatment or disposal. The majority of hazardous waste managed and disposed of by N3B is legacy and environmental remediation waste.

3.3 Hazardous Waste Minimization

During project planning, waste characterization strategy forms (WCSFs) are developed and reviewed by waste management coordinators for the purpose of either minimizing waste or eliminating hazardous materials by replacing them with nonhazardous substitutions before project initiation. Per N3B procedure N3B-P351, R1, “Project Planning and Regulatory Review,” project proposals are presented to N3B subject matter experts (SMEs) for review before project initiation. SMEs routinely identify opportunities for waste minimization, substitution, and hazardous waste best management practices. As N3B develops and refines the waste shipment process and remediation work, hazardous waste minimization is incorporated into policies and procedures.

Universal wastes are minimal, as N3B offices are leased and light tubes are therefore managed by a landlord or property manager. N3B has implemented a battery recycling program that allows N3B employees to recycle their used batteries. Recycling bins, with a 5-gal. capacity, are placed at four buildings in N3B-controlled areas. The bins are collected on a routine basis and shipped to an appropriate facility for recycling. Rechargeable batteries are used for electronic devices whenever feasible. In addition, all administrative buildings at TA-54 have recycling centers for universal waste.

Scrap metal from remediation sites and TA-54 for which assays show no radioactive contamination is recycled. N3B currently uses and will continue to implement recyclable lubricating fluids for equipment, such as highly refined mineral oil instead of more hazardous hydraulic fluid. The mineral oil is recycled at the end of its useful life.

3.4 Barriers to Hazardous Waste Minimization

Current barriers to hazardous waste minimization include limited staff availability and limited procurement of goods and services that assist in recycling and waste minimization. Another barrier is that most material generated is radioactive, and therefore the volume cannot be reduced on-site. This waste goes off-site for disposal.

N3B developed a WCSF to incorporate the recycling of empty environmental media sample containers returned to the Sample Management Office; these sample containers were estimated to represent a waste stream of 2,000 L per year. In February 2020, the N3B Sample Management Office coordinated with craft support to take empty environmental media sample containers to the transfer station to be recycled. All caps were removed from the containers, and a total of 567containers, were delivered to the Los Alamos County transfer station. This waste stream realized approximately a quarter of the estimated waste volume since each container held a 1-L capacity. This waste was generated by best management practice installation and soil erosion minimization conducted by the Storm Water Program.

4.0 MIXED TRANSURANIC WASTE

4.1 Introduction

MTRU waste contains more than 100 nCi of alpha-emitting TRU isotopes per gram of waste as well as hazardous waste regulated under RCRA. TRU isotopes have an atomic number higher than 92 and half-lives that exceed 20 years. TRU waste does not include (1) high-level waste; (2) waste that DOE has determined, with the concurrence of the U.S. Environmental Protection Agency, does not need the degree of isolation required by 40 Code of Federal Regulations (CFR) 191; or (3) waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.

MTRU waste is generated from research, development, nuclear weapons production, and spent nuclear fuel reprocessing. N3B does not generate such wastes but has responsibility for the final disposal of these legacy wastes. MTRU waste is disposed of at the Waste Isolation Pilot Plant (WIPP), a geologic repository near Carlsbad, New Mexico.

MTRU waste can include liquids, cemented residues, combustible materials, noncombustible materials, and non-actinide metals. Liquid MTRU waste is a small percentage of total MTRU waste, and these wastes are primarily organic liquids. MTRU solid waste is packaged for disposal in metal 55-gal. drums, standard waste boxes, or oversized containers and is then stored before being certified for transport and disposal at WIPP.

Standards for packaging waste for acceptance at WIPP change periodically. When this occurs, drums of old operational MTRU waste are repackaged to conform to the new standards. For many years, the majority of MTRU waste shipped to WIPP has come from repackaging activities.

4.2 Waste Stream Analysis

All MTRU wastes located at TA-54 are legacy wastes that are included in the FFCO STP for ultimate disposal. No new MTRU wastes are deliberately generated except through routine management of existing MTRU wastes or environmental remediation wastes, as explained in section 6.0 of this report.

4.3 MTRU Waste Minimization

The N3B CH-TRU Program, which manages and ships mostly legacy MLLW and MTRU wastes, has implemented several activities to reduce the amount of hazardous waste generated from ongoing operational activities. However, no MTRU waste minimization program is in place at this time since all MTRU wastes are legacy wastes. The primary functions of the CH-TRU Program are management and shipping of legacy MLLW and MTRU waste.

4.4 Barriers to MTRU Waste Minimization

Packaging requirements at WIPP often make minimization efforts difficult. In order to protect human health and the environment, the MTRU waste packaging requirements are very stringent. There are radiological wattage and dose limits that must not be exceeded, and a very small volume of MTRU waste may have a high wattage. Containers sent to WIPP are 55 gal. or larger in capacity, and often the containers have very small volumes of waste inside the overpacks, with the majority of the internal volume being empty space.

5.0 MIXED LOW-LEVEL WASTE

5.1 Introduction

For waste to be considered MLLW, it must contain both hazardous and radioactive waste but not be classified as high-level waste, TRU waste, spent nuclear fuel, or byproduct materials such as uranium or thorium mill tailings. Test specimens of fissionable material irradiated only for research and development (i.e., not for the production of power or plutonium), may be classified as LLW provided the activity of TRU waste elements is less than 100 nCi/g.

Most of the routine MLLW comes from stockpile stewardship, remediation activities, and DD&D activities. Most of the non-routine waste is generated by abnormal events such as spills in legacy contaminated areas. Typical MLLW includes contaminated debris, old gloveboxes, legacy chemicals, mercury-cleanup waste, electronics, copper solder joints, and used oil.

5.2 Waste Stream Analysis

Materials and equipment are introduced into a radiological controlled area as needed to accomplish specific work. In the course of operations, materials may become externally contaminated or become activated, thus becoming MLLW when the item is no longer needed.

If MLLW is generated, it is transferred to a satellite accumulation area after generation. Whenever possible, MLLW materials are surveyed to confirm the radiological contamination levels. If decontamination will eliminate the radiological or the hazardous component, materials are decontaminated to prevent them from becoming MLLW.

MLLW is managed in accordance with appropriate waste management and U.S. Department of Transportation requirements. It may be shipped to and stored at on-site less-than-90-day storage areas or permitted storage facilities before transport to off-site commercial or DOE-operated permitted treatment, storage, or disposal facilities.

Reclassification. This is waste formerly classified as MTRU waste, but based on new nondestructive assay measurements, these wastes are reclassified and disposed of as MLLW. Since this waste is already generated, there are no opportunities to minimize this component of the MLLW stream.

Lead Debris. This waste stream could include copper pipes with lead solder, lead-contaminated equipment, brass contaminated with lead, sheets, rags, circuit boards, cathode ray tubes, or personal protective equipment (PPE) contaminated with lead from maintenance activities. This waste stream is generated primarily from remediation campaigns, and volumes of this waste stream are expected to decrease as remediation efforts progress.

Trash and Maintenance. This waste stream consists of PPE, dry painting debris, paper towels, and rags and could also include unwanted equipment that was removed during remediation campaigns.

5.3 MLLW Minimization

MLLW will be generated by cleanup activities and repackaging efforts. The volume of MLLW from these efforts varies significantly from year to year and often cannot be substantially minimized. It is therefore useful to examine the routine fraction of the MLLW waste stream separately to identify good waste minimization opportunities.

5.4 Barriers to MLLW Minimization

Packaging requirements at final disposition locations are often barriers to MLLW minimization. Containers sent for final disposition will have a 55-gal. or greater capacity, often with very small volumes of waste inside the overpacks and the majority of internal volume being empty space.

6.0 REMEDIATION WASTE

6.1 Introduction

The mission of N3B's corrective action activities is to investigate and remediate potential releases of contaminants as necessary to protect human health and the environment. These activities are implemented to comply with Consent Order requirements.

In completing this mission, activities may generate large volumes of waste, some of which may require special handling, treatment, storage, and disposal. Because these activities involve investigating and, as necessary, conducting corrective actions at historically contaminated sites, source reduction and material substitution are impossible to implement. The corrective action process therefore includes the responsibility and challenge of minimizing the risk posed by contaminated sites while also minimizing the amount of waste that will require subsequent management or disposal. Three factors make minimization desirable: the high cost of waste management; the limited capacity for on-site or off-site waste treatment, storage, and/or disposal; and reduction of the associated liability.

6.2 Waste Stream Analysis

This report addresses all RCRA-regulated waste that may be generated by corrective actions during the planning and conducting of investigations and remediation of contaminant releases. Wastes generated include "primary" and "secondary" waste streams.

Primary waste consists of generated contaminated material or environmental media that was present as a result of past DOE activities before any containment or restoration activities. Primary waste includes contaminated building debris or soil from investigations and remedial activities.

Secondary waste streams consist of materials that were used in the investigative or remedial process and may include investigation-derived waste (IDW) such as PPE, sampling waste, or drill cuttings); or treatment residues such as spent resins or activated carbon from groundwater treatment; wastes resulting from storage or handling operations; or additives used to stabilize waste. The corrective actions may potentially generate hazardous waste and MLLW.

6.3 Remediation Waste Minimization

Waste minimization and pollution prevention—through recycling, reuse, contamination avoidance, risk-based cleanup strategies, and other practices—are integral parts of planning activities and field projects. Waste reduction benefits are typically difficult to track and quantify because the data to measure the amount of waste reduced as a direct result of a pollution prevention activity are often not available or not easily extrapolated. In addition, many waste minimization practices employed during previous years are now incorporated into standard operating procedures.

Techniques used to reduce investigation-related waste streams include the following:

Land application of groundwater. Well drilling, development, sampling, rehabilitation/reconfiguration, and use of purge waters constitute a major potential waste source. This procedure incorporates a decision tree negotiated with NMED, allowing groundwater to be land-applied if this will be protective of human health and the environment. Use of this procedure minimizes the amount of purge water that must be managed as wastewater. Using this procedure, 42,255 gal. of water was land-applied during FY 2020.

Land application of drill cuttings. Drill cuttings constitute a major potential source of solid waste generation. This procedure, which incorporates a decision tree negotiated with NMED, allows drill cuttings to be land-applied if this will be protective of human health and the environment. These drill cuttings do not have to be managed or disposed of as waste. In addition, land-applied drill cuttings can be beneficially reused as part of drill site restoration. During FY 2020, no drill cuttings were land-applied.

EMS integration into N3B and subcontractor remediation activities. N3B's EMS has been developed to integrate requirements into the subcontracts and environmental communications through Worker Safety and Security Teams. These activities will increase N3B and subcontractor awareness of waste minimization requirements and opportunities.

Sorting, decontamination, and segregation. This technique is designed to segregate contaminated and uncontaminated soils so that uncontaminated soils can be reused as fill. These practices are implemented at sites where contaminated subsurface soils and structures are overlain by uncontaminated soils. During excavation to remove the contaminated soils and structures, the uncontaminated overburden is segregated and staged apart from contaminated materials. Manmade debris that was present in the excavated material was removed and dispositioned at an off-site TSDF.

Following removal of the contaminated soils and structures, the overburden is tested to verify that it is nonhazardous and meets residential soil-screening levels (SSLs). Material that meets this standard is typically used as backfill for the excavation. This practice minimizes the amount of contaminated soil that must be disposed of as waste and the amount of backfill that must be imported from off-site.

In an FY 2020 effort to reduce remediated soils for disposal as low-level radioactive waste within the Aggregate Areas cleanup efforts, the field execution team requested soil sampling for all excavated materials. All soil and tuff removed from, within, adjacent to (e.g., from benching and/or sloping to stabilize a trench), or below excavated material was managed as environmental media until sampling analysis results were received and reviewed. For those objects to be removed, overburden was separated from underburden and sampled accordingly.

If the soil and tuff were determined to be suitable for reuse, i.e., was nonhazardous waste that met residential SSLs and screening action levels (SALs), the excavated environmental media was segregated from manmade debris and the soil was used to backfill the excavations. If the media did not meet residential SSLs and SALs or were determined to be LLW or hazardous waste, the excavated media was managed as waste. Manmade debris that was present in the excavated material waste stream had to be reported for the off-site profile.

Approximately 1027 yd^3 of soil from the Aggregate Areas cleanup activities met residential SSLs and SALs and was used for fill within the remediated areas, thus reducing the amount of fill that had to be brought in from off-site.

Risk assessment. Risk assessments are routinely conducted for corrective action projects to evaluate the human health and ecological risk associated with a site. The results of the risk assessment may be used by NMED to determine whether corrective measures are needed at a site to protect human health and the environment. The risk assessment may demonstrate that it is adequately protective and appropriate or beneficial to leave waste or contaminated media in place, thus avoiding the generation of waste. Properly designed land-use agreements and risk-based cleanup strategies can provide flexibility to select remedial actions or other technical activities that may avoid or reduce the need to excavate or conduct other actions that typically generate high volumes of remediation waste.

A risk-based data evaluation procedure is used to determine whether the extent of contamination is defined at sites being investigated under the Consent Order. This approach protects human health and the environment while requiring fewer samples and generating less IDW.

Equipment and material reuse. The reuse of equipment and materials such as plastic gloves, sampling scoops, plastic sheeting, and personal protective equipment after proper decontamination to prevent cross-contamination can provide waste reduction and cost savings.

A total of 19,314 kg of metal from TA-21 housekeeping activities was released and transferred to the Los Alamos County Transfer Station for recycle. The metal guard rail, fencing material, ramps, and stairs stored in TA-21 met the criteria for unrestricted radiological release under 10 CFR 835, Occupational Radiation Protection Program, and DOE Order 458.1, Radiation Protection of the Public and the Environment. The initial assessment and categorization of the metals were described in the November 2019 “Release Report for TA-21 Metal Guard Rail, Fencing, Ramps, and Stairs.” They were done in accordance with the Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME) manual (https://www.epa.gov/radiation/marsame-manual-and-resources); DOE Order 458.1; N3B-EPC-ES-FSD-004, “Environmental Radiation Protection”; and N3B-AP-RP-0001, “Data Quality Objectives for Measurement of Radioactivity In or On Items for Transfer Into the Public Domain.”

6.4 Pollution Prevention Planning

The potential to incorporate additional pollution prevention practices into future activities will be evaluated annually as part of the EMS planning efforts. This report will be used during the EMS annual management assessment to continue integration efforts across the organization and align environmental protection and sustainability goals. Further actions related to pollution prevention will be incorporated into the EMS as they are identified. Waste generation, management, and disposition processes are being developed to minimize waste generation and maximize pollution prevention. Specific actions and approaches that will be incorporated into planned corrective-action projects include the following:

- segregation and recycle or reuse of uncontaminated materials,
- continued use of land application of drill cuttings and fluids,
- waste avoidance,
- reuse and recycling of equipment and materials,
- increasing the use of sustainable acquisition strategies, and
- risk-based cleanup strategies.

In addition, pursuant to the January 2012 Framework Agreement, DOE and NMED have agreed to increase the efficiency of cleanup activities while maintaining protection of human health and the environment. These increased efficiencies should result in a reduction in sampling activities for future investigations and a commensurate reduction in IDW generation.

To help improve the implementation of waste minimization activities, N3B ensures communication of environmental and waste minimization concerns to project participants through N3B-P351, “Project

Planning and Regulatory Review (PPRR) Procedure." Waste minimization opportunities are and will continue to be integrated into routine project communications to increase awareness of waste minimization and promote the sharing of lessons learned.

6.5 Barriers to Remediation Waste Minimization

The single largest potential source of waste generated by corrective actions is the removal of buried waste or contaminated soil during the implementation of corrective measures. This approach has the potential to generate thousands of cubic meters of waste. In evaluating corrective measure alternatives, corrective action program and project leaders generally give preference to alternatives that avoid generating large volumes of waste, provided they are protective of human health and the environment. The consideration of other factors by external stakeholders, however, may result in the selection of an alternative that generates more waste than the recommended alternative.