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LA-UR-24-33062

December 2024

**Emergency Planning and Community
Right-To-Know Act of 1986, Title III,
Section 313, Toxic Chemical Release
Inventory Summary Report for 2023**

Prepared by the Environmental Protection Division

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Acronyms and Terms

CAS	Chemical Abstracts Service
ChemDB	chemical inventory-tracking database
DEHP	di-(2-ethylhexyl) phthalate
DOE	U.S. Department of Energy
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
Form R	Toxic Chemical Release Inventory Report
HCl	hydrochloric acid
HE	high explosive
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
lbs	pounds
MMscf	million standard cubic feet
MO _x	mixed oxide
MRF	Material Recycle Facility
NPDES	National Pollutant Discharge Elimination System
OB/OD	open burn/open detonation
PACs	polycyclic aromatic compounds
PBTs	bioaccumulative toxics
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RLWTF	Radioactive Liquid Waste Treatment Facility
SERF	Sanitary Effluent Reuse Facility
SO ₃	sulfur trioxide
SWSC	Sanitary Wastewater Systems Consolidation
TA	Technical Area
TRI	Toxic Release Inventory
TRI-DDS	TRI-Data Delivery System (software)

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**EMERGENCY PLANNING AND COMMUNITY
RIGHT-TO-KNOW ACT OF 1986, TITLE III, SECTION 313,
TOXIC CHEMICAL RELEASE INVENTORY
SUMMARY REPORT FOR 2023**

**By
Environmental Compliance Programs Group**

ABSTRACT

For reporting year 2023, Los Alamos National Laboratory (LANL) submitted a Toxic Chemical Release Inventory Report (Form R) for lead as required under the Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313. No other EPCRA Section 313 chemicals were used in 2023 above the reportable thresholds. This document was prepared to provide a description of the evaluation of EPCRA Section 313 chemical use and threshold determinations for LANL for calendar year 2023, as well as to provide background information about data included on the Form R report.

Section 313 of EPCRA specifically requires facilities to submit a Form R to the U.S. Environmental Protection Agency (EPA) and state agencies if the owners and operators manufacture, process, or otherwise use any of the listed toxic chemicals above listed threshold quantities. EPA compiles this data in the Toxic Release Inventory database. Form Rs for each chemical over threshold quantities must be submitted on or before July 1 each year and must cover activities that occurred at the facility during the previous year.

In 1999, EPA promulgated a final rule on persistent bioaccumulative toxics (PBTs). This rule added several chemicals to the EPCRA Section 313 list of toxic chemicals and established lower reporting thresholds for these and other PBT chemicals that were already reportable. These lower thresholds became applicable in reporting year 2000. In 2001, EPA expanded the PBT rule to include a lower reporting threshold for lead and lead compounds. Facilities that manufacture, process, or otherwise use more than 100 lbs of lead or lead compounds must submit a Form R.

1.0 INTRODUCTION

On April 21, 2000, President Clinton signed Executive Order (EO) 13148, which requires all federal facilities to comply with the provisions of the Emergency Planning and Community Right-to-Know Act (EPCRA), or Title III of the Superfund Amendments and Reauthorization Act of 1986. EO 13148 supersedes EO 12856 of 1995. Section 313 of EPCRA specifically requires facilities to submit a Toxic Chemical Release Inventory Report (Form R) to the U.S. Environmental Protection Agency (EPA) and state agencies if the owners and operators manufacture, process, or otherwise use any of the listed toxic chemicals above listed threshold quantities. On October 19, 1999, the EPA promulgated a final rule on persistent bioaccumulative toxics (PBTs) (EPA 1999a). This rule added several chemicals to the EPCRA Section 313 list of toxic chemicals and established lower reporting thresholds for these and other PBT chemicals that were already reportable under EPCRA Section 313. These lower thresholds became

applicable in reporting year 2000. On January 17, 2001, the PBT rule was amended to include lead and lead compounds. The rule lowered the reporting threshold for lead and lead compounds to 100 lbs. The lower threshold for lead became applicable in reporting year 2001.

The EPA compiles the data submitted on the Form Rs in a Toxic Release Inventory (TRI) database. The TRI database provides the public with information on the releases of EPCRA Section 313 chemicals in their communities as well as provides the EPA with release information to assist in determining the need for future regulations (<http://www.epa.gov/tri/>). Form R must be submitted on or before July 1 each year and must cover activities that occurred at the facility during the previous calendar year. Even though federal facilities were not required to report under EPCRA Section 313 until 1995, Los Alamos National Laboratory (LANL or the Laboratory) had been voluntarily reporting under EPCRA Section 313 since 1987.

For reporting year 2023, the Laboratory submitted a Form R report for lead. No other EPCRA Section 313 chemicals were used in 2023 above the reportable thresholds. Toxic chemicals used in exempt activities as defined by the regulation are excluded from the threshold determinations and release calculations. Descriptions of these exempt activities are included in Section 2.2 of this report.

This report summarizes the data evaluation, exemption analysis, activity determinations, and threshold determinations for toxic chemical use at the Laboratory in 2023 and describes the environmental release data reported on the Form R. Individual sections for certain toxic chemicals used at the Laboratory are included in this report. Appendix A presents a summary table of EPCRA Section 313 chemicals procured at the Laboratory in 2023. Appendix B and C include copies of the Form R reports submitted to the EPA.

1.1 Facility Information and Contacts

LANL is located at a latitude of 35°49'51" and longitude of 106°14'15" in Los Alamos County, New Mexico. The Laboratory is owned by the U.S. Department of Energy (DOE) and operated by Triad National Security, LLC.

Facility information is as follows:

- LANL
 - TRI facility identification number: 87545LSLMSLOSAL
 - LANL technical contact: Mr. Walter Whetham at (505) 695-8056
 - LANL public contact: Mr. Steven Horak at (505) 551-4514
- Los Alamos DOE complex
 - TRI facility identification number: 87544SDL52835
 - DOE technical contact: Mr. Robert Gallegos at (505) 901-3824
 - DOE public contact: Ms. Toni Chiri at (505) 667-6691

2.0 ACTIVITY DETERMINATIONS, EXEMPTIONS, AND QUALIFIERS

2.1 Activity Determinations

EPCRA Section 313 chemical usage is evaluated against three activity determinations. For listed chemicals that are not PBTs, the thresholds are described below.

2.1.1 Manufacture

The term manufacture means to produce, prepare, compound, or import an EPCRA Section 313 chemical. The term manufacture also includes coincidental production of an EPCRA Section 313 chemical as a result of the manufacture, processing, otherwise use, or treatment of other chemical substances. The threshold for reporting manufactured chemicals is 25,000 lbs.

2.1.2 Process

The term process means the preparation of a listed EPCRA Section 313 chemical, after its manufacture, for distribution in commerce. Processing is usually the intentional incorporation of an EPCRA Section 313 chemical into a product. The threshold for reporting processed chemicals is 25,000 lbs.

2.1.3 Otherwise Use

The term otherwise use usually means any use of an EPCRA Section 313 chemical, including in a mixture or trade name product or waste that is not covered by the terms manufacture or process. The threshold for reporting otherwise use chemicals is 10,000 lbs.

2.1.4 Persistent Bioaccumulative Toxics

For the subset of chemicals listed as PBTs, lower reporting thresholds have been established for individual chemicals ranging from 100 lbs to 0.1 grams. These lower thresholds apply to each of the activity determinations: manufacture, process, and otherwise use. Although the threshold for each activity is the same, each chemical must be evaluated against the activity determinations to determine in which activity the chemical is used. Threshold determinations for PBTs are evaluated separately against the manufacture, process, and otherwise use activities described above.

2.2 Exemptions

Exemptions from EPCRA Section 313 toxic chemical reporting applicable to the Laboratory are discussed below.

2.2.1 Laboratory Activities Exemption

EPCRA Section 313 chemicals that are manufactured, processed, or otherwise used in laboratory activities at a covered facility under the direct supervision of a technically qualified individual do not have to be considered for threshold determinations and release calculations. However, pilot plant scale, specialty chemical production, or the use of chemicals for laboratory support activities do not qualify for this laboratory activities exemption.

2.2.2 Otherwise Use Exemption

Certain activities involving EPCRA Section 313 chemicals qualify as otherwise used and are specifically exempted. These include:

- otherwise use as a structural component of the facility,
- otherwise use in routine janitorial or facility grounds maintenance,
- personal uses by employees or other persons,
- otherwise use of products containing EPCRA Section 313 chemicals for the purpose of maintaining motor vehicles operated by the facility, or
- otherwise use of EPCRA Section 313 chemicals contained in intake water (used for processing or non-contact cooling) or in intake air (used either as compressed air or for combustion).

2.2.3 Article Exemption

EPCRA Section 313 chemicals contained in articles that are processed or otherwise used are exempt from threshold determinations and release calculations. For an item to be exempt as part of an article, it must satisfy the following three criteria:

- be a manufactured item that is formed to a specific shape or design during manufacture,
- have end-use functions dependent in whole or in part on its shape or design during end use, and
- must not release an EPCRA Section 313 chemical under normal circumstances of processing or otherwise use of the item at the facility. Total releases from any item or like items qualifying as article exempt must be equal to or less than 0.5 lbs to remain exempt as articles (EPA 2006).

2.2.4 De Minimis Exemption

The *de minimis* exemption allows facilities to exempt certain minimal concentrations of EPCRA Section 313 chemicals contained in mixtures or other trade name products when making threshold determinations and release calculations. The *de minimis* concentrations are set by EPA at either 1% or 0.1%, depending on whether or not the chemical is a suspected carcinogen or carcinogen.

EPA eliminated the *de minimis* exemption for the list of PBT chemicals. This means that facilities must include all amounts of PBTs in threshold determinations and release and other waste management calculations regardless of the concentration of the PBTs in mixtures or trade name products.

2.3 Qualifiers

In addition to exemptions, certain EPCRA Section 313 chemicals have qualifiers. Qualifiers indicate that these chemicals are subject to the reporting requirements only if manufactured, processed, or otherwise used in a specific form or when a certain activity is performed. Examples of qualifiers are shown in Table 2-1.

Table 2-1. Examples of EPCRA Section 313 Chemical Qualifiers

Chemical Name	Chemical Abstracts Service (CAS) Number	Qualifier
Aluminum	7429-90-5	Only if it is a fume or dust form
Hydrochloric Acid (HCl)	7647-01-0	Only if it is an aerosol form
Isopropyl Alcohol	67-63-0	Only if it is being manufactured by the strong acid process
Sulfuric Acid	7664-93-9	Only if it is an aerosol form
Nitrate Compounds	NA*	Only when in aqueous solution
Vanadium	7440-62-2	Except when contained in an alloy

* NA = not applicable.

3.0 ANALYSIS FOR THRESHOLD DETERMINATIONS

There are several steps in determining when a chemical triggers reporting under EPCRA Section 313. When a chemical is manufactured, processed, or otherwise used in amounts greater than the threshold quantity, a Form R and release calculations are required. Figure 3-1 presents a flowchart that shows the steps the Laboratory performs to determine which chemicals must be reported under EPCRA Section 313.

3.1 Threshold Determinations for Chemical Use

The Laboratory tracks chemicals brought onsite using a chemical inventory-tracking database called ChemDB. ChemDB captures the majority of procured chemicals and provides relevant data (e.g., chemical name, CAS number, quantity, etc.) to assist in threshold determinations. The underlying assumption used in the preliminary threshold determinations for reporting under EPCRA Section 313 is that chemicals are purchased and used in the same calendar year. If unusually large purchases are noted in this preliminary analysis, further investigation is performed to determine if bulk chemicals were purchased and only a portion of them used in the calendar year.

3.1.1 Inventory

For calendar year 2023, a total of 54,525 records were added to ChemDB and evaluated; 15,126 were pure chemicals and 39,399 records were mixtures. Individual items with identifiable CAS numbers in ChemDB were considered pure chemicals. These items were matched by CAS number to the list of EPCRA Section 313 chemicals. The resulting records were summed in pounds for each pure chemical.

Individual items that did not have CAS numbers in ChemDB were considered mixtures. The exemptions discussed in Section 2.2 of this report were applied to the mixtures and each qualifying item was classified according to the applicable exemption. Material safety data sheets for the remaining mixtures purchased in quantities greater than 50 lbs were reviewed to determine the presence and amount of EPCRA Section 313 constituents. This was done to ensure that the chemicals with thresholds greater than 50 lbs would be identified. Listed chemicals with thresholds less than 50 lbs were examined individually, based on process knowledge and known potential sources. Each mixture that contained an EPCRA Section 313 chemical was further evaluated to determine the weight of each constituent. The totals for these amounts were then added to the quantities of pure EPCRA Section 313 chemicals.

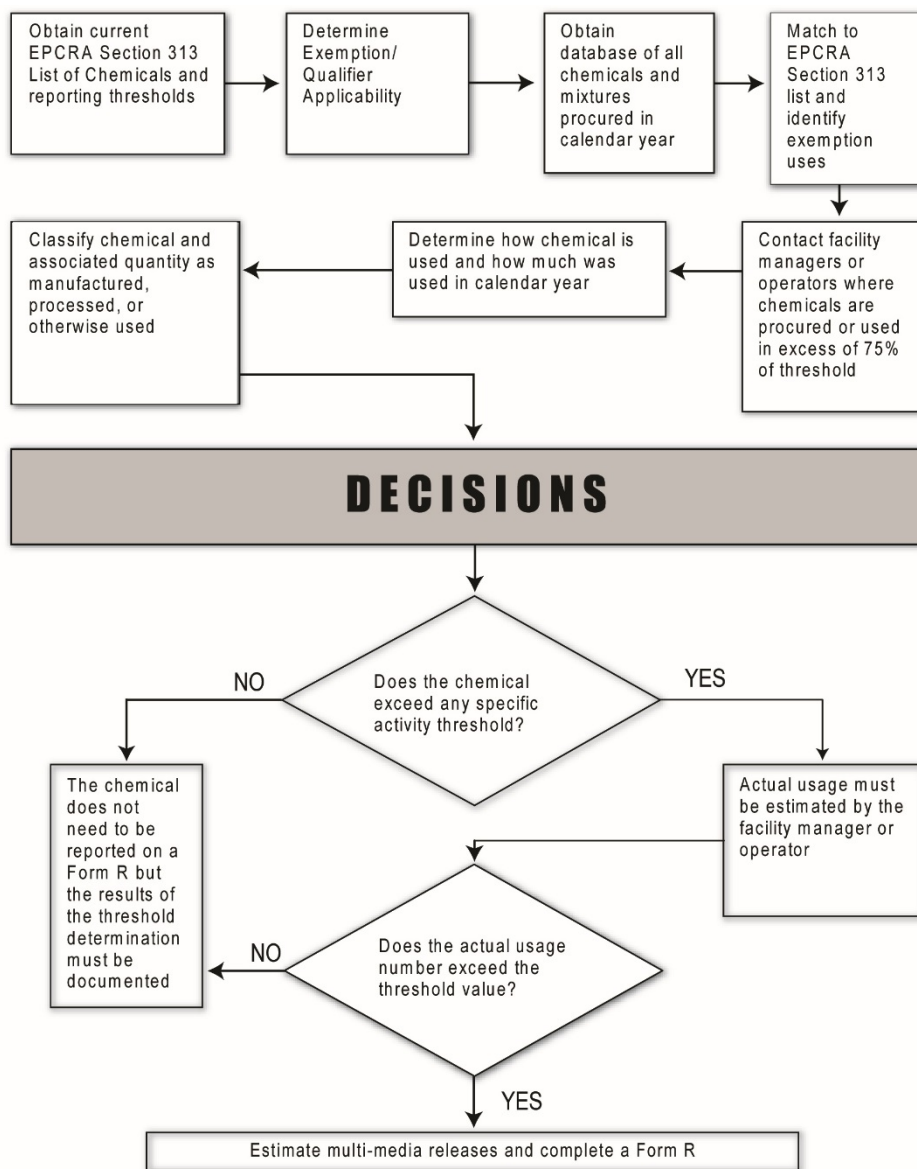


Figure 3-1. Flowchart process of analysis for EPCRA Section 313 reporting

3.1.2 Chemical Analysis

The following steps were taken to analyze chemicals:

- Identify and label exemptions through electronic text searches. The exemptions are from 40 Code of Federal Regulations 372.38, Exemptions for Toxic Release Reporting. When a chemical is exempt, it is not considered when determining whether an applicable threshold has been met. Specifically, chemical containers were classified as follows:
 - **Maintenance**—routine janitorial or facility grounds maintenance (e.g., cleaning supplies, paints, fertilizers, and pesticides);
 - **Maintaining Motor Vehicles** (e.g., antifreeze, brake fluid);

- **Personal Uses**—non-process related items for employee personal use;
 - ***De Minimis***—the percent of a non-PBT Section 313 chemical in a mixture is less than 1% for a non-carcinogen or 0.1% for a carcinogen;
 - **Article**—structural component exemption; and
 - **Laboratory Activities**—if a toxic chemical is manufactured, processed, or used in a laboratory at a covered facility under the supervision of technically qualified individual.
- Identify and label EPCRA Section 313 compounds. There are 30 different chemical categories included on the EPCRA Section 313 list. Many of these categories do not have specific CAS numbers associated with them, except for polycyclic aromatic compounds (PACs) and dioxins. These two categories were evaluated in ChemDB as part of the pure chemical evaluation since they have searchable CAS numbers for compounds included in their categories. The other classes of compounds were searched in the 2023 ChemDB dataset by using chemical-specific text searches in the chemical name field.
 - Match pure chemicals (chemical containers with an identifiable CAS number) with the list of EPCRA Section 313 chemicals by matching CAS numbers.

A few EPCRA Section 313 chemicals were selected for further analysis to determine if they were used in exempt activities. For 2023, the chemicals that were analyzed in more detail included:

- mercury compounds,
- sulfuric acid,
- PACs,
- nitric acid,
- nitrate compounds,
- hydrochloric acid,
- dioxins, and
- lead compounds.

3.2 Threshold Determination Results

3.2.1 Procurement Totals

The amounts of listed EPCRA Section 313 chemicals identified in the ChemDB, direct procurement, and other sources were all summed together to perform preliminary threshold determinations. The resulting totals for the top 10 listed EPCRA Section 313 chemicals are summarized in Table 3-1.

A complete table of EPCRA Section 313 chemicals showing all contributing sources is provided in Appendix A. Chemicals that were procured in amounts greater than 75% of the applicable EPCRA Section 313 threshold were evaluated further and the analyses are summarized in Section 4 of this report.

Table 3-1. Top 10 EPCRA Section 313 Chemicals Procured in 2023

CAS No	Chemical Name	Total Procured (lbs)
7647-01-0	Hydrochloric Acid	175,818*
7697-37-2	Nitric Acid	7,313
67-63-0	Isopropyl Alcohol	4,935
67-56-1	Methanol	1,436
Polychlorinated Alkanes	Pokychlorinated Alkanes (C10 to C13)	1,399
75-09-2	Dichloromethane	945
110-54-3	n-Hexane	883
Cadmium	Cadmium Compounds	836
7664-93-9	Sulfuric Acid	717
Barium	Barium Compounds	445

* The total procured for HCl includes both aerosol and aqueous forms. See Section 4.6 for additional analysis.

4.0 ADDITIONAL EVALUATION OF CERTAIN TOXIC CHEMICALS

The toxic chemicals described below either are used in relatively high volumes at the Laboratory, have very low reporting thresholds, are of special interest, or have been reported in the past. Additional analyses were required to determine total usage of these chemicals. None of the chemicals presented in this section exceeded any of the applicable thresholds in 2023 and therefore no reporting was required.

4.1 Mercury

Mercury and mercury compounds are used in various places throughout the Laboratory. As part of the PBT rule, the threshold for EPCRA Section 313 reporting of mercury was reduced to 10 lbs. In 2023, mercury was used in four areas at the Laboratory. Each is described below.

4.1.1 Mercury Procurements

A listing of all procurements in 2023 of mercury and mercury compounds was extracted from ChemDB. Line items containing a CAS number for mercury (7439-97-6) were included, as well as any line items containing the word “mercury” or the symbol “Hg” in the text description.

In ChemDB, the total amount of mercury was 0 lbs and the total amount of mercury compounds was 28.66 lbs. The purchasers or users of the mercury and mercury compounds were contacted to determine:

- If the purchase was actually mercury or contained mercury or mercury compounds,
- If a mixture or solution, what concentration of mercury the mixture or solution contained, and
- If the mercury was used in a laboratory experiment setting and, if so, it is subject to the laboratory exemption under EPCRA Section 313.

According to EPCRA Section 313 guidance documents, the laboratory exemption is applied to the quantity of a listed toxic chemical that is manufactured, processed, or otherwise used in a laboratory under the supervision of a technically qualified person. A total of 25.29 lbs of mercury was determined to be laboratory exempt. The chemical names of the exempted containers are “mercury standard solutions” which contain only parts per million (ppm) quantities of mercury.

For chemical purchases, the total amount of mercury applied to the otherwise used threshold is 0 lbs and the total amount of mercury compounds added to the otherwise used is 3.36 lbs.

4.1.2 Los Alamos Neutron Science Center Shutter System

The largest use of mercury at the Laboratory is in the Los Alamos Neutron Science Center (LANSCE) shutter system. Reservoirs of mercury are used as shields on the neutron beam shutter system. When the beam is operated, pressurized helium is forced into the mercury reservoir, pushing the mercury up into a head space and allowing the neutron beam to pass through the shutter. LANSCE maintains 12 neutron beam shutter systems, each with a reservoir of mercury. The total amount of mercury in these reservoirs is approximately 12,000 lbs. Each reservoir is a closed system and only opened occasionally when minor repairs or maintenance are performed.

During 2023, minor maintenance was performed on the mercury shutter system. However, no mercury was removed or added to the shutter system in 2023.

4.1.3 Fuel Combustion

In 2023, the Laboratory generated mercury compound emissions from the following combustion sources: the asphalt plant, the Technical Area (TA) 3 power plant, the TA-3 combustion turbine, and from numerous small boilers. The mercury compound emissions from these sources totaled 7.55 lbs towards the manufactured threshold. Additionally, mercury is found in diesel fuel as an impurity. According to EPA guidance, the concentration of mercury in diesel fuel is 0.001 ppm (EPA 2001a). LANL used approximately 36,414 gallons of diesel fuel in 2023 and this equates to 0.00026 lbs of mercury towards the otherwise used threshold.

4.1.4 Conclusion

The total amount of mercury qualifying as otherwise used equals 0 lbs and the total amount of mercury compounds qualifying as otherwise used equals 3.36 lbs. Both amounts are below the reporting threshold value of 10 lbs. The total amount of mercury compounds manufactured was 7.55 lbs and is also below the reporting threshold of 10 lbs. Therefore, it was determined that reporting mercury under EPCRA Section 313 is not necessary for 2023. A summary of the 2023 mercury threshold determination is provided in Table 4-1.

Table 4-1. Summary of 2023 Mercury Threshold Determination

Description	Amount of Mercury (lbs)	Amount of Mercury Compounds (lbs)	EPCRA Section 313 Activity Determination	EPCRA Section 313 Activity Threshold (lbs)
Mercury Purchases	0	3.36	Otherwise Used	10
LANSCE Shutter System	0	0		
Fuel Combustion	0.00026	0		
Total	0.00026	3.36		
Fuel Combustion	0	7.55	Manufactured	10
Total	0	7.55		

* NA = not applicable.

4.2 Sulfuric Acid

EPCRA Section 313 reporting guidelines state that sulfuric acid must be reported only if it is in an aerosol form, including mists, vapors, gas, fog, and other airborne forms of any particle size. This category would include acid aerosols generated in storage tanks and from fuel combustion.

Sulfuric acid aerosols are generated as a result of storage tank emissions, fuel combustion byproducts, natural gas combustion, and asphalt production. The total amount of sulfuric acid mist generated from these activities was 4,203 lbs, less than the 25,000-lb manufacture threshold and, therefore, not reportable under EPCRA. Based on EPA guidance for fuel oil (diesel fuel) combustion, it is assumed that all sulfur trioxide (SO₃) emissions are in the form of sulfuric acid (EPA 1998a). For natural gas combustion, it is conservatively assumed that all sulfur oxides emissions are in the form of sulfuric acid mist because separate SO₃ emission factors are not available.

For 2023, ChemDB shows that a total of 717 lbs of sulfuric acid was procured and used at various locations at the Laboratory. Most of these were small purchases ranging from 1.0 to 30 lbs, and are most likely used in analytical chemistry work. This liquid form of sulfuric acid is not reportable under EPCRA. As for the other purchases of sulfuric acid captured in ChemDB, they are assumed to be in aerosol form since the specific usages are unknown. Total purchases do not exceed the otherwise use reporting threshold. A summary of the threshold determinations for sulfuric acid is provided in Table 4-2.

Table 4-2. Sulfuric Acid Threshold Determination for 2023

Description	Amount of Sulfuric Acid (lbs)	Data Source	EPCRA Section 313 Activity Determination	EPCRA Section 313 Activity Threshold (lbs)
Fuel Oil Combustion Byproducts	0.11	AP-42 and fuel use records	Manufactured	25,000
Natural Gas Combustion	4,203	AP-42 and facility records		
Asphalt Production	0	AP-42 and facility records		
Storage Tanks	0	EPA Tanks 4.0 model		
Total Manufactured	4,203			

* NA = not applicable.

4.3 Polycyclic Aromatic Compounds

PACs are a chemical category included on the EPCRA Section 313 list as part of the PBT rule. The threshold for reporting PACs is 100 lbs. Benzo(g,h,i)perylene is a PAC that has its own separate threshold. The threshold for benzo(g,h,i)perylene is 10 lbs.

According to EPA's "EPCRA Section 313 Guidance for Reporting Toxic Chemicals: Polycyclic Aromatic Compounds Category" (EPA 2001b), fuel oil and paving asphalt contain PACs. In addition, PACs may be generated from the combustion of natural gas and fuel oil and the manufacture of asphalt. Each of these sources of PACs was evaluated and is described below.

4.3.1 Procurement of PACs

Under EPCRA Section 313, the PAC category includes 25 specific chemicals and an additional 51 chemical mixtures that are listed as potentially containing PACs. A search of the ChemDB dataset was done using CAS numbers for the 25 chemicals and text searches for the 51 chemical mixtures. No matches were identified. An analysis of ChemDB data showed a total of 19.5 lbs of PACs from 2023 chemical purchases.

4.3.2 PACs from Asphalt Production

In 2023, the Laboratory's onsite asphalt plant produced 4,694 tons of asphalt. Additionally, Española Transit Mix provided 354 tons of asphalt amounts to LANL. Therefore, a total of 9,411 tons of asphalt was used at LANL in 2023.

A review of project management records for 2023 identified projects that involved the purchase of asphalt from outside contractors. Work tickets and project management records were reviewed to identify asphalt jobs that qualify as routine facility maintenance and are exempt under EPCRA Section 313. Routine facility maintenance includes patching of potholes, repair of roads and parking lots, and resurfacing of existing parking lots.

According to EPA guidance, asphalt tar (used in making asphalt) may contain as high as 178 ppm of PACs (EPA 2001b). However, Chevron-Texaco, the supplier of the asphalt tar, provided information specific to their product (Chevron-Texaco 2001). The concentration of PACs in the asphalt tar is 8 ppm, which is significantly lower than the default value listed in the EPA's PACs guidance. The manufacturer-supplied value was used in the calculation of PACs.

In 2023, using the 8 ppm concentration, the total amount of PACs otherwise used at LANL in asphalt was 4.03 lbs, which is below the reporting threshold of 100 lbs.

The concentration of benzo(g,h,i)perylene in asphalt, from "EPA's Guidance for Reporting on Pesticides and other Persistent Bioaccumulative Toxics" (EPA 2001c), is 1.2 ppm. This figure adds 0.6 lbs of benzo(g,h,i)perylene reportable towards its 10-lb otherwise use threshold.

4.3.3 PACs from Fuel Oil Combustion

Approximately 36,414 gallons of diesel fuel were used in 2023 in the Laboratory's power plant and miscellaneous boilers and generators. According to EPA guidance, fuel oil may contain 10 ppm of PACs (EPA 2001b). However, data provided by Chevron-Texaco indicate diesel may contain 22 ppm of PACs (Chevron-Texaco 2001). The 22 ppm was used in these calculations. This equates to 5.69 lbs of PACs that apply to the otherwise use threshold. The concentration for benzo(g,h,i)perylene was found to be 0.05 ppm according to EPA guidance (EPA 2001c). Data provided by Chevron-Texaco indicated concentrations of 9 ppm. The 9 ppm value was used in these calculations and results in 2.33 lbs of benzo(g,h,i)perylene applicable to the 10-lb otherwise use threshold.

Combustion of fuel oil generates emissions of PACs that apply to the manufacture threshold. Using AP-42 emission factors (EPA 1998a), these amounts were calculated to be 0.001 lbs for total PACs and 0.0001 lbs for benzo(g,h,i)perylene.

4.3.4 PACs from Natural Gas

Approximately 1,731.1 million standard cubic feet (MMscf) of natural gas were burned at the Laboratory facilities in 2023. Using AP-42 emission factors (EPA 1998b) and fuel records, approximately 0.03 lbs of PACs were produced from natural gas combustion, which is applied to the manufacture threshold.

Approximately 0.002 lbs of benzo(g,h,i)perylene applies toward the 10-lb manufacture threshold. Due to the absence of information regarding total PAC and benzo(g,h,i)perylene concentrations in natural gas, it was assumed these substances are negligible in natural gas before combustion.

4.3.5 Summary of PACs

Asphalt production was the largest source of PACs at the Laboratory in 2023. The total amount otherwise used from all sources was 29.22 lbs. The total amount manufactured from combustion of fuel oil and natural gas was 0.031 lbs. Both threshold quantities for otherwise use and manufacture were below the 100-lb threshold; therefore, it was determined that reporting of PACs under EPCRA Section 313 was not necessary.

Benzo(g,h,i)perylene concentrations in asphalt tar and diesel fuel totaled 2.39 lbs towards the otherwise used threshold. Combustion processes accounted for 0.0021 lbs, which is considered to be manufactured. These values are below the reporting threshold of 10 lbs. Therefore, benzo(g,h,i)perylene reporting was not necessary under EPCRA Section 313 in 2023. Table 4-3 summarizes the PACs and benzo(g,h,i)perylene threshold determinations.

Table 4-3. LANL 2023 Threshold Determinations for PACs and Benzo(g,h,i)perylene

EPCRA Chemical/Compound	Process or Material	Amount (lbs)	Total (lbs)	EPCRA Section 313 Activity Determination	EPCRA Activity Threshold (lbs)
Total PACs	Purchased	19.5	29.22	Otherwise Used	100
	Asphalt tar	4.03			
	Impurity in fuel oil	5.69			
	Natural gas combustion	0.03	0.031	Manufactured	100
	Fuel oil combustion	0.001			
Benzo(g,h,i)perylene	Purchased	0.0	2.39	Otherwise Used	10
	Asphalt tar	0.6			
	Impurity in fuel oil	2.33			
	Natural gas combustion	0.002	0.0021	Manufactured	10
	Fuel oil combustion	0.0001			

4.4 Nitric Acid

In general, nitric acid is used in high volumes at the Laboratory every year. The main uses are research and development activities, sample preparation, plutonium processing, and the Laboratory's bioassay program. Small amounts of nitric acid are used for cleaning glassware. The total amount of nitric acid used at LANL in 2023 did not exceed the EPCRA Section 313 otherwise use threshold of 10,000 lbs.

4.4.1 Procurement

Nitric acid procured and used at the Laboratory in 2023 was evaluated to determine the amounts that could be applied to the EPCRA Section 313 laboratory exemption. According to EPCRA Section 313 guidance documents, the laboratory exemption is applied to the quantity of a listed toxic chemical that is manufactured, processed, or otherwise used in a laboratory under the supervision of technically qualified personnel. However, quantities of a listed toxic chemical used for cleaning glassware do not qualify for this exemption.

In 2023, a total of 7,753 lbs of nitric acid was procured at the Laboratory, based on queries of the ChemDB system. Some of the purchase records indicate the nitric acid is actually 69 to 71% nitric acid in an aqueous solution, or more dilute solutions. In almost all cases, the nitric acid is purchased as “lab grade,” which is 65% to 70% nitric acid in water. The concentration of the nitric acid purchases was taken into account and the resulting amount of pure nitric acid purchased was calculated to be 6,662 lbs.

Historically, between 70 to 75% of total nitric acid has been used in laboratory use, which is an exempt activity. Since the amount purchased in 2023 is less than 67% of the threshold for reporting, no attempt was made to separate the laboratory use and otherwise use.

4.4.2 TA-55 Plutonium Processing

Plutonium processing facility management was contacted to obtain information on the amount of nitric acid used in plutonium processing in 2023. TA-55 personnel did not purchase any bulk nitric acid for their bulk storage tank in 2023, nor did the facility perform any plutonium processing activities. The bulk nitric acid system was out of service for most of 2023. No nitric acid was moved from the bulk storage tank to smaller storage tanks within some of the processing areas. Therefore, no nitric acid was used for plutonium processing activities, and there were no nitric acid emissions.

4.4.3 Summary

Nitric acid use in 2023 is below the EPCRA 313 10,000-lb otherwise used threshold, and therefore is not reportable. Table 4-4 provides a summary of nitric acid use at LANL in 2023.

Table 4-4. Nitric Acid Threshold Determination for 2023

Description	Amount of Nitric Acid (lbs)	EPCRA Section 313 Activity Determination	EPCRA Section 313 Activity Threshold (lbs)
Laboratory Use	0	Lab Exempt	Exempt
Otherwise Use		Otherwise Use	10,000
<ul style="list-style-type: none"> Non-Lab, or unknown use 	6,662		
<ul style="list-style-type: none"> Plutonium Processing (TA-55 actual use) 	0		
Total Otherwise Use	6,662		

4.5 Nitrate Compounds

According to the EPA's EPCRA Section 313 Guidance "List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting" (EPA 2000a), nitrate compounds may be manufactured through the elemental neutralization of nitric acid and through the collection and treatment of sanitary wastewater. These sources of nitrate compounds are applicable to the Laboratory and are discussed in this section. The reporting thresholds for nitrate compounds are 25,000 lbs for manufacture/import or process and 10,000 lbs for otherwise used. Only the manufacture and otherwise used thresholds apply to the Laboratory for 2023 EPCRA reporting.

The above listed guidance provides a list of approximately 50 nitrate compounds that are included as water dissociable nitrate compounds. Although this list is not exhaustive, it provides commonly identified nitrate compounds. Only those compounds in aqueous solution (>50% water) are required to be reported. Also, a *de minimis* concentration of 1% is applied to all nitrate compounds found in mixtures. When determining the reporting threshold for nitrate compounds, the entire nitrate compound is included (both the nitrate and its counter ion) toward determining the threshold. If the threshold is exceeded, only the nitrate portion of the compound is reported.

For the manufacture threshold, the sources reviewed included waste nitric acid treated at the Radioactive Liquid Waste Treatment Facility (RLWTF), which uses sodium hydroxide in an elementary neutralization process. The other source was the SWSC Plant. The nitrate compounds that were applied to the otherwise used threshold included nitrate compounds purchased or used during 2023. Other nitrate compounds evaluated were determined to be non-aqueous and were not required to be included in threshold determinations.

4.5.1 Chemical Review

A query of ChemDB was performed to determine the amount of chemicals applied to the otherwise used threshold. Approximately, 262 lbs of nitrate compounds were purchased in 2023. A few of the purchases were clearly nitrate compounds in a powder (non-aqueous) form and do not count towards the EPCRA threshold. These purchases are typically removed from the threshold totals. However, since the total pounds purchased was so small, all purchases were counted towards the threshold.

4.5.2 Sanitary Wastewater

The SWSC Plant collects sanitary wastewater (sewage and other allowable discharges) from several LANL facilities and treats the wastewater in a standard primary (physical), secondary (biological) treatment system. Information was collected from the SWSC Plant on nitrate influent concentration and total flow rate for the purpose of EPCRA Section 313 threshold determination. The information provided for 2023 indicated that the average nitrate concentration of the influent was 1.89 milligrams per liter and the total flow into the system was 70,385,000 gallons.

Using the flow rate given by the plant, the total annual average amount of nitrate compound (as sodium nitrate) was calculated. At the average nitrate concentration of 1.89 milligrams per liter, and adjusting the weight to include the sodium ion, the total sodium nitrate processed as an impurity was 1,520 lbs in 2023.

The information provided by SWSC Plant personnel also included the amount and the nitrate concentration of the effluent treated water. The total amount of treated water out of the SWSC Plant in

2023 was 103,049,000 gallons. The average nitrate concentration was 2.99 milligrams per liter. This calculates to a total of 3,521 lbs of nitrates (as sodium nitrate) manufactured.

The SWSC Plant is a zero discharge facility and all treated water is kept in a holding pond and pumped to the TA-3 power plant for use in cooling towers. Therefore, there are no releases to the environment from the SWSC Plant.

4.5.3 Nitric Acid Neutralization

Typically, waste nitric acid from the mixed oxide (MO_x) fuel process and from the Nitric Acid Recycling System, both located at the Plutonium Facility, is sent to the RLWTF for treatment. At the RLWTF, the waste acid is collected in a 5,000-gallon holding tank. Once the tank is approximately 25% full, the waste is neutralized using 25% sodium hydroxide. Once neutralized, the wastewater is sent to a 20,000-gallon holding tank awaiting the evaporation process. Periodically, the wastewater collected is sent through an evaporator to reduce the volume of water. The distillate is about two-thirds the volume of the initial aqueous stream. The remaining one-third is concentrate, called evaporator bottoms, and is sent off site for drying, repackaging, and is then returned to LANL for disposal at TA-54.

The RLWTF received no acid waste transfers from TA-55 in 2023 and the facility did not treat acid waste in 2023. The amount of nitrate compounds formed due to nitric acid treated at the RLWTF is usually calculated using the formula found in the EPA “Nitrate Compound Guidance” (EPA 2000a). Since there was no treatment of the nitric acid waste, there were no nitrate compounds formed in 2023.

4.5.4 Summary

Nitrate compounds that apply to the otherwise used reporting threshold of 10,000 lbs includes the chemicals found in ChemDB. A total of 262 lbs of nitrate compounds were purchased and assumed to be in aqueous form. This is well below the 10,000-lb EPCRA 313 threshold.

Nitrate compounds that apply to the manufacture reporting threshold of 25,000 lbs includes those identified in the sanitary wastewater at the SWSC Plant and the nitrate compounds identified during the elementary neutralization of nitric acid at the RLWTF. The amount manufactured as a by-product at the SWSC Plant is 1,520 lbs. No nitrate compounds were formed due to nitric acid neutralization activities at the RLWTF in 2023.

The amount of nitrate compounds processed as an impurity at the SWSC Plant was 3,521 lbs. This applies to a separate 25,000 processing threshold. Table 4-5 provides a summary of nitrate compounds in 2023.

Table 4-5. Summary of Nitrate Compounds at LANL in 2023

Description	Amount of Nitrate Compounds (lbs)	EPCRA Section 313 Activity Determination	EPCRA Section 313 Activity Threshold (lbs)
Purchased in ChemDB (assumed in aqueous form and otherwise used)	262	Otherwise Used	10,000
Processed at the SWSC Plant	1,520	Processed	25,000
Manufactured at the SWSC Plant	3,521	Manufactured	25,000
Manufactured at the RLWTF	0		
Total Manufactured	1,626		

4.6 Hydrochloric Acid

The total amount of HCl procured in calendar year 2023 was 175,818 lbs. A total of 174,500 lbs of 31% HCl was used at SERF. This equals 53,223 lbs of pure HCl. The remaining 1,318 lbs is attributed to many small users and is 10 to 100% HCl and is used in various laboratory settings.

The large quantity of HCl used at SERF is used for pH adjustment of treated sanitary effluent, and in the microfilter cleaning tanks. The HCl is received as a 31% aqueous solution in 300- to 330-gallon totes and transferred to a 1,500-gallon HCl storage tank where it is then piped to the two processes in a nearly closed system. The aqueous form of HCl is exempt from EPCRA 313 reporting and HCl in aerosol form needs to be considered for threshold determinations (EPA 1999b). However, when the HCl is transferred into the storage tank, HCl vapors in the head space of the tank are vented in aerosol form.

In 2013, the EPA TANKS 4.09 emissions estimating software was run to estimate the amount of HCl vapors formed based on the number of turnovers of the tank and tank and site conditions (see Table 1). HCl is not a listed chemical in the TANKS software. EPA instructions describe two options for using the TANKS software for chemicals not included in the chemical list: (1) use a feature to add new chemicals with physical properties such as molecular weight, vapor pressure, liquid density, vapor density; (2) use a surrogate chemical that is included in the TANKS chemical list that has similar physical properties. For this analysis we have chosen a surrogate chemical, ethylcyclopentane, which has a similar, but slightly higher vapor pressure. This should result in a slightly higher (conservative) estimate of emissions. Meteorological data from Albuquerque was used from the TANKS program, which should also provide slightly conservative estimates since Albuquerque has slightly higher average temperatures than Los Alamos.

Results from the TANKS software showed a total of 114.6 lbs of HCl vapor formed and emitted from the tank in 2013 when total HCl was 510,000 lbs. Since the amount of HCl purchased and throughput to this tank in 2023 is significantly less, emissions would also be less. Therefore, it was deemed unnecessary to run the TANKS software again since the estimate from 2013 can be used as a worst case estimate for 2023.

Using a worst case assumption that all minor purchases of HCl end up in vapor form, we have a total of 1,318 lbs of HCl towards the otherwise used threshold, and 114.6 lbs of HCl from the SERF tank counted towards the manufactured threshold. Both of these are well below the reporting thresholds of 10,000 lbs for otherwise used, and 25,000 lbs for manufactured. Therefore, it is not necessary to report HCl in 2023.

4.7 Dioxins

Dioxins are a group of PBTs formed during combustion processes. The EPCRA Section 313 reporting threshold for the dioxins category is 0.1 gram manufactured, processed, or otherwise used. This limit applies to toxic-equivalent compounds, a category of dioxins consisting of 17 specific dioxin and dioxin-like compounds. These “compounds with chlorine substitution in the 2, 3, 7, 8-positions on the molecule are reportable under the EPCRA Section 313 dioxin and dioxin-like compounds category” (EPA 2000b).

Activities at the Laboratory that were evaluated for dioxins include explosives activities and fuel combustion. Each is described below.

4.7.1 Explosives Activities

Dioxins are formed by burning chlorine-based chemical compounds with hydrocarbons producing an unintentional byproduct in many industrial processes involving chlorine. One potential source of dioxin formation at the Laboratory is open burn/open detonation (OB/OD) of high explosives (HEs). This is because many binders and plasticizers found in HE materials have chlorine in their chemical make-up. Therefore, analysis of HE materials and associated binders/plasticizers was performed to estimate dioxin emissions.

Information on HE materials, such as explosive type, explosive name, composition, and chemical formula, was obtained from Laboratory personnel and textbooks. Some HE materials contain binders and plasticizers. These binders and plasticizers were evaluated and screened for those that contained chlorine. For those chlorine-containing binders/plasticizers, the weight percent chlorine in each was determined and the HE materials having chlorine-containing binders were further evaluated. Knowing the weight percent binder/plasticizer in these explosives and the weight percent chlorine in each binder, the amount of binder and amount of chlorine in each HE material containing chlorine was determined. Due to the unique nature of these materials, no specific dioxin emission factors are available. Therefore, a dioxin emission factor for burning of polyvinyl chloride in accidental fires was used to estimate dioxin emissions from burning of the chlorine-containing materials (ASME 1995). An emission factor of 4 micrograms dioxin emitted per ton of material burned was used.

Based on available information, estimated emissions from dioxins formed by OB/OD of HE materials totaled 0.0044 grams in 2023. Burning of HE materials at the LANL Burn Ground was evaluated separately for dioxin formation. A more conservative approach was used to estimate dioxin emissions from burning of HE materials. The assumption was made that all HE-contaminated waste could potentially result in dioxin formation. Emission factors developed by the EPA for the burning of ammonium perchlorate propellant were used (EPA 1998c). Based on estimating emissions from all waste materials burned, dioxin emissions were 0.000035 grams in 2023.

4.7.2 Fuel Combustion

The Laboratory burns natural gas and diesel fuel in numerous boilers, heaters, and generators. No emission factors for dioxins were found for natural gas combustion. However, EPA EPCRA guidance for dioxins provides an emission factor of 3,178.6 picograms per liter of diesel fuel burned (EPA 2000b). The Laboratory burned a total of 36,414 gallons of diesel fuel in 2023. Total dioxin formation from burning diesel fuel was calculated to be 0.00044 grams for 2023.

The total calculated dioxin emissions in 2023 are below the 0.1 gram threshold and, therefore, reporting under EPCRA Section 313 is not required. Table 4-6 summarizes the amount of dioxins formed from all sources characterized for 2023.

Table 4-6. Dioxin Threshold Determination for 2023

Description	Amount of Dioxin Formed (grams)	EPCRA Section 313 Activity Determination	EPCRA Section 313 Threshold (grams)
HE Burned	0.000035	Manufactured	0.1
HE Expended	0.0044		

Fuel Combustion	0.00044		
Total Dioxin Formed	0.00483		

5.0 LEAD FORM R REPORTING

5.1 Threshold Determination

Lead and lead compounds are used in various processes throughout the Laboratory. In January 2001, the EPA promulgated a rule lowering the threshold for EPCRA Section 313 reporting of lead and lead compounds to 100 lbs, effective for reporting year 2001. In 2023, lead and lead compounds were otherwise used, processed, or manufactured in the following operations at the Laboratory.

5.1.1 Lead Procurements

A listing of all procurements in 2023 of lead and lead compounds was extracted from ChemDB. Line items containing a CAS number for lead (7439-92-1) were included, as well as any line items containing the word “lead” or the symbol “Pb” in the text description.

The total amount of lead and lead compounds added to ChemDB for 2023 was 244.72 lbs. Line items in ChemDB that were clearly described as lead standards were assumed to be used in a laboratory setting and exempt from reporting. Purchasers were also contacted to determine if their lead was used for exempt activities. This accounted for 0.11 lbs. The total amount of lead and lead compounds from procurements applied to the otherwise used threshold is 244.61 lbs. This includes 1.65 lbs applied to the lead threshold and 242.95 lbs applied to the lead compound threshold.

5.1.2 Lead Use at the Firing Range

Lead is a component in various types of ammunition. The Laboratory maintains an onsite firing range for training security personnel. The firing range keeps detailed records of the amount and type of munitions expended. The U.S. Department of Defense developed software for estimating usage and releases of EPCRA Section 313 chemicals from various munitions activities. The TRI-Data Delivery System (TRI-DDS) software was unavailable for 2023. In order to calculate the amounts of toxic chemicals associated with munitions used at LANL for comparison with EPCRA Section 313 reporting thresholds and calculation of environmental releases for 2023, the previous years (2002 through 2018) reports were used to supply information used in the 2023 calculations.

The total lead released to the environment at the firing range in 2023 was lower than the previous year. It was determined that 1,036 lbs of lead was released to land (non-air) and 4.2 lbs of lead compounds were otherwise used.

Lead compounds are also manufactured through the firing of ammunition. Additionally, firing of ammunition containing lead created (manufactured) 2.3 lbs of lead compounds as air emissions.

5.1.3 Lead from Fuel Combustion

In 2023, the Laboratory emitted lead compound emissions from the following combustion sources: the TA-3 power plant, the TA-3 combustion turbine, and from numerous small boilers, which used

approximately 1,759 MMscf of natural gas. The AP-42 emission factor for lead compounds from natural gas combustion in both large and small boilers is 0.0005 lbs/MMscf. The lead compound emissions from these sources totaled 0.88 lbs towards the manufactured threshold. The Laboratory also burned an estimated 36,414 gallons of diesel fuel in boilers, heaters, and diesel-fired generators. The AP-42 emission factor for diesel fuel combustion is 0.00123 lbs per 1,000 gallons, this equates to 0.04 lbs of lead compound manufactured.

Additionally, lead is found in fuel oil and natural gas as an impurity. According to EPA guidance (EPA 2001d), the concentration of lead in No. 2 fuel oil is 0.5 ppm and in natural gas is 0.05 milligrams per cubic meter. The 36,414 gallons of fuel oil contained 0.13 lbs of lead and 1,759 MMscf of natural gas contained 5.43 lbs of lead, totaling 5.56 lb which is added to the otherwise used threshold.

5.1.4 Lead Use at LANSCE

The Laboratory continues to maintain an inventory of lead shielding and lead bricks at LANSCE and other areas of the Laboratory. In recent years, the Laboratory has attempted to reduce the inventory by sending some of the lead offsite to be reused. According to the EPA's web-based TRI advanced training course presented by Science Applications International Corporation on May 10, 2005, "the recovery of a listed Section 313 chemical for further distribution in commerce or commercial use is 'processing' of that chemical." Also, materials sent offsite for direct reuse are not reported on Form R, but materials sent offsite for recycling are reported on Form R in Part II, Section 6.2. The EPA considers the direct recirculation of a toxic chemical within a process or between processes without any intervening reclamation or recovery to be reuse. Furthermore, reclamation or recovery does not include simple phase changing of the toxic chemical before further reuse (e.g., simple remelting of scrap metal).

The process for shipping scrap metal for reuse has been centralized at the Material Recycle Facility (MRF), part of LANL's salvage process. The MRF stages the metal and coordinates pick-up by a metal recycling company. The MRF estimates that 5,661 lbs of lead were shipped offsite for reuse in 2023.

The lead sent to the metal recycling company is considered processed because it is distributed for commercial use. The metal recycling company repackages the lead and then sends it to a lead smelter. Because the lead is simply remelted, it is defined as reused. Therefore, it will not be reported on Form R in Part II, Section 6.2.

5.1.5 Other LANL Operations Using Lead and Lead Compounds

The Sigma Foundry, located at TA-3-66, melts lead in order to declassify parts. In 2023, the foundry did not melt any lead and there were no stack air emissions as a result.

In previous years, the Laboratory has conducted operations to decontaminate lead shielding and lead melting and cutting operations to form new shielding. Onsite processing of both of these activities was suspended in 2000. However, LANSCE resumed processing in 2013 and reported that no lead was sent to Ace Metals for recycling in 2023.

5.1.6 Conclusion

Table 5-1 summarizes the threshold determination for lead and lead compounds for 2023. Based on these operations, it was determined that lead was otherwise used and processed over threshold quantities.

Table 5-1. Summary of Threshold Determination for Lead and Lead Compounds for 2023

Activity	Lead Use (lbs)	Lead Compound Use (lbs)	Comments
Lead Purchases (ChemDB)	1.65	242.95	Otherwise Used 0.11 lbs Lab Exempt
Firing Range	1,036	4.2	Otherwise Used
Firing Range	0	2.3	Manufactured
Fuel Combustion	0	0.92	Manufactured (sum of natural gas, diesel, and propane from asphalt plant)
Fuel Combustion	5.56	0	Otherwise Used
Lead Recycle/Resale from MRF (sold to Ace Metals)	5,661	0	Processed, all of it is reused and not reported on the Form Rs
Sigma Foundry	0	0	Processed
TOTALS	Otherwise Used – 1,043.2 Processed – 5,661	Otherwise Used – 247.2 Manufactured – 3.2	Reporting Thresholds = 100 lbs

5.2 Environmental Releases and Offsite Disposal

For 2023, LANL exceeded the otherwise used threshold of 100 lbs for lead and also exceeded the processed threshold of 100 lbs for lead. Therefore, a Form R for lead must be submitted, which includes reporting on air emissions, water discharges, land disposal, and offsite waste disposal.

5.2.1 Air Emissions

In 2023, LANL emitted lead compound emissions to the atmosphere in the form of both fugitive and stack emissions. The sources for the lead compound air emissions include the firing range, fuel combustion, Sigma Foundry, and the RLWTF evaporator.

5.2.1.1 Firing Range

The Laboratory operates a firing range onsite for security personnel training. Monthly records are maintained detailing the type and amount of ammunition used at the firing range. In order to calculate the amounts of toxic chemicals associated with munitions used at LANL for comparison with EPCRA Section 313 reporting thresholds and calculation of environmental releases for 2023, the previous years (2002 through 2018) reports were used to supply information used in the 2023 calculations. Based on the results of the analysis, a total of 2.1 lbs of lead compounds were emitted as fugitive air emissions from the firing range in 2023.

5.2.1.2 Fuel Combustion

In 2023, the Laboratory emitted lead compounds from the following combustion sources: the asphalt plant, the TA-3 power plant, generators, and from numerous small boilers and heaters. Emissions from the burning of both natural gas and diesel fuel were calculated. The total emissions from these combustion sources totaled 0.92 lbs of lead compound stack emissions.

5.2.1.3 RLWTF Evaporator

The RLWTF has an effluent evaporator at TA-55 in order to evaporate off water collected at the effluent outfall directly to the atmosphere. The effluent water contained 0.09 grams of lead, which equates to 0.00027 lbs of lead emitted as stack air emissions.

5.2.1.4 Sigma Foundry

The Sigma Foundry, located at TA-3-66, melts lead in order to declassify parts. In 2023, the foundry did not melt any lead. Thus, there were no Sigma Foundry lead stack air emissions in 2023.

5.2.1.5 Conclusion

In 2023, the Laboratory emitted a total of 3.02 lbs of lead to the atmosphere, including 2.1 lbs of fugitive emissions and 0.92 lbs of stack emissions. The fugitive emissions are from the firing range. The stack emissions include emissions from fuel oil/diesel combustion sources and natural gas combustion sources from the RLWTF Evaporator. Table 5-2 summarizes lead air emissions from the Laboratory as reported on Form R.

Table 5-2. Lead Air Emissions from LANL in 2023

Emission Source	Total Lead Emissions (lbs)	Fugitive or Stack
Firing Range	2.1	Fugitive
Fuel Combustion	0.92	Stack
Sigma Foundry	0	Stack
RLWTF Evaporator	0.00009	Stack
Total	3.02	

5.2.2 Releases to Water

This section describes the amount of lead released to the environment from the Laboratory during 2023, as measured at LANL's National Pollutant Discharge Elimination System (NPDES) outfalls, which quantifies the amount of listed chemicals released due to facility operations during the reporting period.

EPCRA requires the reporting of TRI listed chemicals released to the environment during the year in which they are originally released. The inclusion of surface and storm water data within the annual release dataset is an overestimate as these data do not represent current year releases, but measure the migration and transport of existing contaminant inventory that 1) was released to the environment before initiation of annual EPCRA reporting, 2) is unrelated to the original environmental release, and 3) cannot be differentiated from, and likely effectively masks, actual environmental releases. Therefore, annual EPCRA reporting will only include annual original release data as directly measured at NPDES outfalls.

NPDES outfall data, generated as part of the Laboratory's Outfall Monitoring Program, were obtained from the Water Quality Permitting/Compliance Team. Outfall 051 is the only LANL outfall that has discharge limits for lead. In 2011, LANL sampled for a full slate of analytes (including lead) at each outfall as part of the NPDES Permit renewal process. The New Mexico Environment Department analyzes the concentration and determines if it is likely that the surface water standard for each analyte

could be exceeded. If the standard is not likely to be exceeded then there is no permit limit for that constituent.

For the EPCRA Section 313 Form R, Section 5.3 reporting, the total amount of lead released to each receiving stream is reported. For NPDES outfall data, the receiving stream associated with each sample location was determined through the use of the Laboratory’s Annual Site Environmental Report maps and information received from LANL’s Water Quality and RCRA Group. The following table summarizes the total lead discharged from each of the three tributaries on Pajarito Plateau that LANL discharged to during 2023. Total lead release to streams was 0.249 lbs. Table 5-3 was used to complete Section 5.3.1 of the Form R.

Table 5-3. Lead Releases to Water in 2023 from LANL NPDES Outfall

Canyon	LANL NPDES Outfall Lead (lbs)
Sandia Tributary to Rio Grande	0.185
Mortandad Tributary to Rio Grande	0.020
Los Alamos Tributary to Rio Grande	0.044
Total of NPDES Discharges	0.249

5.2.3 Releases to Land

Lead releases to land at the Laboratory occur as a result of firing range activities. Lead releases to land are based on the amount of munitions used during the year and the lead content of the munitions used. Lead content for munitions used at the Laboratory was estimated by matching the munitions types with tables created with data extracted from the TRI-DDS. A total of 1,036 lbs of lead was released to land at the firing range at LANL in 2023.

5.2.4 Offsite Waste Disposal

The Waste Management Programs Group provided waste characterization and disposal data from the Waste Compliance and Tracking System (WCATS), for lead wastes that were shipped offsite in 2023. Laboratory and article exempt waste was removed from the dataset. EPCRA article and laboratory exemptions have been documented in previous years’ memos and are described in the EPA/TRI Guidance Document “Toxic Chemical Release Inventory Reporting Forms and Instructions for RY2008” (EPA 2008).

The WCATS data included the percent of lead and container weight for almost all of the waste shipments. In most cases, the waste profile form provided sufficient information to complete the lead calculation. For some waste items, estimates of the percentage of lead were made by matching it with similarly described waste shipments from current and/or previous years’ analyses. If the WCATS data did not give the percentage of lead, the most conservative amount was used or the generator was contacted for more information.

5.2.4.1 Disposal Fate

The EPCRA Form R requires information about each treatment/disposal facility that received waste from the Laboratory, including how much was sent to each waste treatment/disposal facility and additional

information regarding waste treatment, recycling, or disposal conducted at each facility. A Waste Disposal/Treatment Code must be entered in Section 6.2.C of the Form R for each facility receiving waste. The Waste Disposal/Treatment Codes were updated by the EPA in 2005 and are included on pages 54 and 55 of the “Toxic Chemical Release Inventory Reporting Forms and Instructions for RY2008” (EPA 2008) guidance document.

5.2.4.2 Results

The amount of lead contained in waste that was shipped offsite from the Laboratory in 2023 was 15,102.7 lbs. This total weight of lead was calculated by multiplying the total waste weight (kilograms) by the percentage of lead within each waste item, and then converted to pounds.

EPCRA reportable waste items shipped offsite from the Laboratory to several waste treatment/disposal facilities in 2023 are summarized in Table 5-4. As per EPCRA guidelines, only the values greater than 0.5 lbs of lead in 2023 were included in the summary table and on the Form R. For the facilities that added between 0 lbs and 0.5 lbs of waste, the facility information was included on the Form R and a value of 0 lbs was entered for the amount of waste disposed.

Table 5-4. Summary of Waste Disposal Facilities Receiving LANL Lead Waste in 2023

Company	Address	Facility EPA ID	Ultimate Fate of Waste	Total Lead (lbs)
Energy Solutions, LLC	Tooele County, I-80, Exit 49, Clive, UT 84029	UTD982598898	Landfill	6,351.5
Perma-Fix Northwest, Inc.	2025 Batelle Rd, Richland, WA 99354	WAR000010355	Other Land Disposal	5.2
Veolia ES Technical Services, LLC (CO)	9131 East 96 th Avenue, Henderson, CO 80640	COD980591184	Other Land Disposal	1,240.3
Waste Control Specialists, LLC, TSD Facility	9998 W. State Highway 176, Andrews, TX 79714	TXD9888088464	Other Land Disposal	409.0
Waste Isolation Pilot Plant	4021 National Parks Highway, Carlsbad, NM 88221	NM4890139088	Solidification/Stabilization of Metals	7,044.2
U. S. Ecology (NV)	Hwy 95, 12 miles south of Beatty, Beatty, NV 89003	NVT330010000	Other Land Disposal	3.3
Veolia ES Technical Solutions, LLC UT)	709 North Taylor Way Suite B, North Salt Lake, UT 84054	UTR000007138	Other Land Disposal	0.1
Mesa Oil, Inc. - Plant	Belen, NM 87002	NMD000096024	Other Reuse or Recovery	6.0
Perma-Fix	1940 NW 67 th Place, Gainesville, FL 32653	FLD980711071	Land Treatment	42.7
US DOE, NNSA in care of MSTs, LLC	WM, NNSA, Mercury, NV 89023	NV3890090001	Transfer to Waste Broker/ Disposal	0.1
Waste Management of New Mexico	33 rd St. Northern Blvd., Rio Rancho, NM 87124	NMD986683563	Other Landfills	0.3
			Total	15,102.7

5.3 Other Information Provided on Form R

Environmental releases of lead as air emissions, to surface waters, and onsite land releases were reported to be 3.02 lbs, 0.249 lbs, and 1,036 lbs, respectively. These values are included in Section 5 of the Form R, Quantity of the Toxic Chemical Entering Each Environmental Medium Onsite. A total of 15,103 lbs of lead was reported in Section 6.2 of the Form R, Transfers to Other Offsite Locations.

Methods of treating lead in wastewater effluent before discharge were included in Section 7A of the Form R, which details onsite waste treatment methods and efficiency. Wastewater from industrial processes at the Laboratory is discharged to the RLWTF before discharge to NPDES-permitted Outfall 051. The RLWTF conducts a series of treatment steps that reduce the amount of metals in the effluent. The wastewater stream goes through precipitation, filtration, neutralization, and reverse osmosis treatment. All wastewater is sampled for lead before and after treatment. Based on analytical results for 2023, the RLWTF resulted in a 99.953% treatment efficiency of lead in the wastewater. Sections 7B and 7C of the Form R relate to onsite energy recovery and recycling. The Laboratory performed no onsite processes applicable to these sections for lead in 2023.

Section 8 of the Form R refers to source reduction and recycling activities. The information provided by the EPA for this section states that no energy recovery is possible for lead, either onsite or offsite. The Laboratory also reported no onsite recycling or treatment for lead.

Section 8.9 of the Form R reports the production or activity ratio, an estimated measure of production or activity involving the reported chemical, as compared to the previous year. Because the Laboratory is not a production facility, a surrogate measure was needed to complete this section of the Form R. To determine this value, the firing range was used as a representative activity that would maintain a consistent use of lead. The amount of lead munitions used in 2023 was divided by the amount used in 2022 to obtain an activity ratio of 0.84.

6.0 EPCRA SECTION 313 SUMMARY AND TRENDS

The Laboratory has submitted EPCRA Section 313 data to the EPA since 1987. From 1987 to 1994, this information was submitted by the University of California, operator of LANL. Starting with reporting year 1995, EO 12856 required all federal facilities to comply with EPCRA Section 313 requirements. As of 1995, EPCRA Section 313 information for the Laboratory has also been submitted by the DOE. Historical information on LANL-reported Section 313 releases is included in the EPA TRI database and can be accessed at <http://www.epa.gov/tri/>.

The Laboratory has implemented numerous pollution prevention projects to reduce use and releases of EPCRA Section 313 chemicals. However, two regulatory changes made by the EPA in recent years impact EPCRA Section 313 reporting:

- On October 19, 1999, the EPA promulgated a final rule on PBTs. This rule added several chemicals to the EPCRA Section 313 list and established lower reporting thresholds for PBT chemicals (EPA 1999a). These lower thresholds became applicable in reporting year 2000.
- On January 17, 2001, the EPA changed the PBT rule to reduce the EPCRA Section 313 reporting threshold for lead and lead compounds to 100 lbs (from 10,000 lbs). The new lead threshold became applicable with reporting year 2001.

As a result of these regulatory changes, the Laboratory has triggered EPCRA Section 313 reporting for lead and mercury in recent years. The regulatory changes resulted in reporting thresholds of 100 lbs for lead. Therefore, LANL has submitted environmental release data on lead since the rule changed.

Figure 6-1 provides a summary of LANL-reported releases for the period from 2004 through 2023.

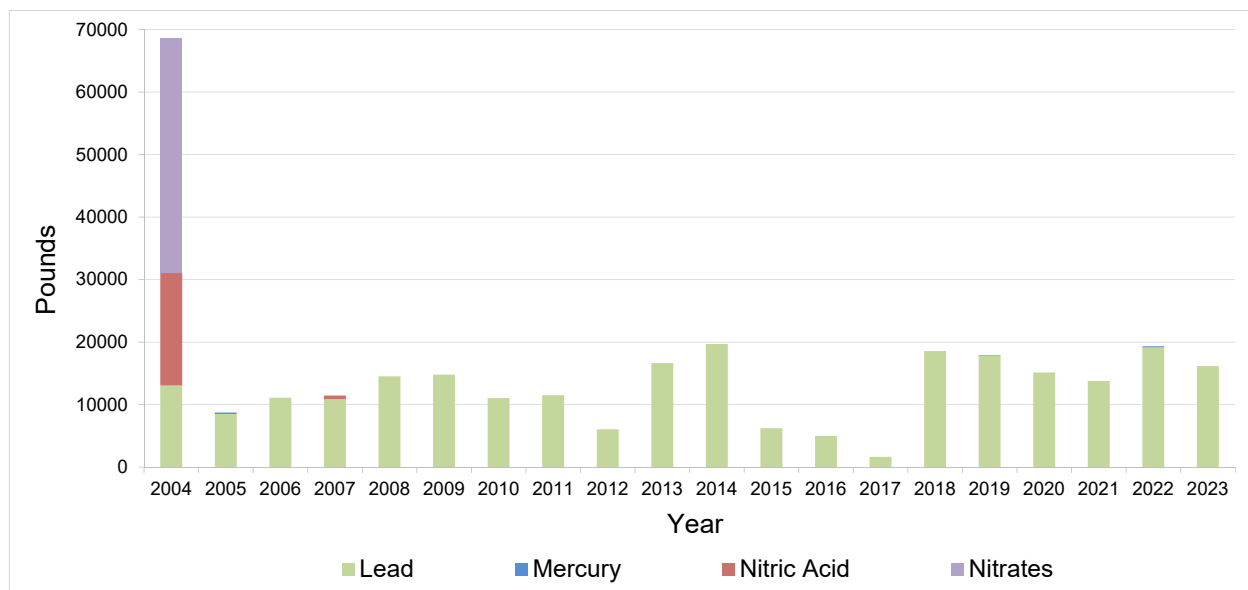


Figure 6-1. Trends in LANL's reported releases to EPA TRI

Several points are worth noting from this chart:

- In the late 1990s, the Laboratory implemented a Nitric Acid Recycling System to reduce the amount of new nitric acid needed for plutonium processing. This closed-loop recycle system greatly reduced the need to purchase nitric acid, and due to recycling efforts, nitric acid use was below reporting thresholds for several years. However, in 2004 a new process to convert weapons-grade plutonium to MO_x fuels for nuclear power plants was implemented. Due to quality specifications and facility constraints, this project was unable to use recycled nitric acid. Therefore, nitric acid was reportable for 2004.
- In 2005, the plutonium processing facility had very limited operations due to ongoing facility maintenance and equipment upgrades. Therefore, nitric acid use was well below reporting thresholds for 2005. In late 2006, the maintenance and equipment upgrades were completed and operations restarted. Nitric acid use for 2006 was still just below reporting thresholds. In 2007 nitric acid was again reportable due to resumption of higher levels of plutonium processing activities.
- Because there were no identified users of recycled nitric acid, and limited storage capacity, in 2004, spent nitric acid from plutonium processing was sent to the RLWTF for treatment and disposal. However, the treatment process for nitric acid was neutralized and resulted in formation of nitrate compounds. For the first time in 2004, nitrate compounds were manufactured above reportable quantities and triggered reporting.

- Although the use of lead and lead compounds has been relatively constant over the years at the Laboratory, the threshold for reporting was lowered to 100 lbs in 2001. The Laboratory first began EPCRA Section 313 reporting on lead in that year. About that same time, LANL made a concerted effort to reduce onsite inventory of lead bricks and shielding that is no longer needed. Much of this lead shielding is radioactively contaminated and cannot be recycled. Therefore, large amounts of legacy lead were shipped offsite for disposal and reported on the Form Rs.
- The largest use of mercury at the Laboratory is in the LANSCE shutter system. Reservoirs of mercury are used as shields on the neutron beam shutter system. Each reservoir is a closed system and only opened occasionally when minor repairs or maintenance are needed. Mercury has only triggered reporting during the years that maintenance activities have occurred on the shutter systems. Environmental releases of mercury are very low.

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APPENDIX A:
EPCRA Section 313 Chemicals Used or Procured in 2023

CAS Number	Chemical Name	Threshold (lb)	Sum (lb)
7647-01-0	Hydrochloric acid (aerosol forms only)	10000	175818.28
7697-37-2	Nitric acid	10000	7313.38
67-63-0	Isopropyl alcohol (mfg-strong acid process)	10000	4935.14
67-56-1	Methanol	10000	1435.94
Polychlorinated Alkanes	Polychlorinated alkanes (C10 to C13)	10000	1399.19
75-09-2	Dichloromethane	10000	945.46
110-54-3	n-Hexane	10000	883.32
Cadmium	Cadmium Compounds	10000	835.80
7664-93-9	Sulfuric acid (aerosol forms only)	10000	717.33
Barium	Barium Compounds	10000	444.52
108-88-3	Toluene	10000	408.59
75-05-8	Acetonitrile	10000	284.42
Nitrate	Nitrate compounds (water dissociable)	10000	262.08
Glycol Ethers	Glycol Ethers	10000	257.67
Lead	Lead Compounds	100	243.61
68-12-2	N,N-Dimethylformamide	10000	236.25
107-21-1	Ethylene glycol	10000	167.74
67-66-3	Chloroform	10000	156.63
7782-50-5	Chlorine	10000	95.58
1344-28-1	Aluminum oxide (fibrous forms)	10000	83.19
7664-39-3	Hydrogen fluoride	10000	78.41
7664-41-7	Ammonia	10000	77.19
107-06-2	1,2-Dichloroethane	10000	60.50
7664-38-2	Phosphoric acid	10000	44.63
Copper	Copper Compounds	10000	43.39
127-18-4	Tetrachloroethylene	10000	39.53
79-01-6	Trichloroethylene	10000	38.62
872-50-4	N-Methyl-2-pyrrolidone	10000	38.38
7783-06-4	Hydrogen sulfide	10000	34.45
Mercury	Mercury Compounds	10	28.66
71-36-3	n-Butyl alcohol	10000	24.11
Zinc	Zinc Compounds	10000	23.11
Nickel	Nickel Compounds	10000	21.24

Polycyclic aromatic compounds	Polycyclic aromatic compounds (includes 21 chemicals and 51 mixtures)	100	19.48
123-91-1	1,4-Dioxane	10000	16.82
Cyanide	Cyanide Compounds	10000	15.97
108-10-1	Methyl isobutyl ketone	10000	15.86
111-42-2	Diethanolamine	10000	14.73
106-42-3	p-Xylene	10000	14.24
64-18-6	Formic acid	10000	13.85
62-53-3	Aniline	10000	12.34
110-86-1	Pyridine	10000	11.49
7440-02-0	Nickel	10000	10.98
50-00-0	Formaldehyde	10000	10.89
108-05-4	Vinyl acetate	10000	10.27
9016-45-9	Poly(oxy-1,2-ethanediyl), α -(nonylphenyl)- ω -hydroxy-	10000	9.39
7726-95-6	Bromine	10000	9.08
95-50-1	1,2-Dichlorobenzene	10000	8.64
71-43-2	Benzene	10000	8.53
7632-00-0	Sodium nitrite	10000	8.07
78-93-3	Methyl ethyl ketone	10000	7.11
7440-62-2	Vanadium (fume or dust)	10000	6.74
Manganese	Manganese Compounds	10000	5.35
56-23-5	Carbon tetrachloride	10000	5.26
75-65-0	tert-Butyl alcohol	10000	5.16
Silver	Silver Compounds	10000	5.00
1634-04-4	Methyl tert-butyl ether	10000	4.90
100-44-7	Benzyl chloride	10000	4.85
96-33-3	Methyl acrylate	10000	4.74
Cobalt	Cobalt Compounds	10000	4.72
141-32-2	Butyl acrylate	10000	3.96
121-44-8	Triethylamine	10000	3.70
Chromium	Chromium Compounds	10000	3.68
108-95-2	Phenol	10000	3.47
120-82-1	1,2,4-Trichlorobenzene	10000	3.21
106-93-4	1,2-Dibromoethane	10000	2.95
7440-50-8	Copper	10000	2.85
75-15-0	Carbon disulfide	10000	2.78
64-67-5	Diethyl sulfate	10000	2.60
7440-43-9	Cadmium	10000	2.34
7429-90-5	Aluminum (fume or dust)	10000	2.25
117-81-7	Di(2-ethylhexyl) phthalate	10000	2.20
7440-36-0	Antimony	10000	2.20

26628-22-8	Sodium azide (Na(N ₃))	10000	2.12
78-84-2	Isobutyraldehyde	10000	1.97
78-92-2	sec-Butyl alcohol	10000	1.79
123-72-8	Butyraldehyde	10000	1.77
7439-92-1	Lead	100	1.65
77-09-8	Phenolphthalein	10000	1.29
7550-45-0	Titanium tetrachloride	10000	1.26
100-41-4	Ethylbenzene	10000	1.12
79-10-7	Acrylic acid	10000	1.10
139-13-9	Nitrilotriacetic acid	10000	1.10
584-84-9	Toluene-2,4-diisocyanate	10000	1.10
7440-48-4	Cobalt	10000	1.10
Chlorophenols	Chlorophenols	10000	1.10
109-86-4	2-Methoxyethanol	10000	1.06
95-47-6	o-Xylene	10000	0.97
108-38-3	m-Xylene	10000	0.95
107-18-6	Allyl alcohol	10000	0.94
Antimony	Antimony Compounds	10000	0.85
Selenium	Selenium Compounds	10000	0.83
80-15-9	Cumene hydroperoxide	10000	0.79
78-79-5	Isoprene	10000	0.75
Nicotine and salts	Nicotine and salts	10000	0.67
7440-41-7	Beryllium	10000	0.61
120-80-9	Catechol	10000	0.61
91-20-3	Naphthalene	10000	0.61
822-06-0	Hexamethylene-1,6-diisocyanate	<10000	0.58
81-07-2	Saccharin (manufacturing)	10000	0.55
7723-14-0	Phosphorus (yellow or white)	10000	0.55
123-31-9	Hydroquinone	10000	0.55
106-89-8	Epichlorohydrin	10000	0.55
91-97-4	3,3'-Dimethyl-4,4'-diphenylene diisocyanate	<10000	0.55
55406-53-6	3-Iodo-2-propynyl butylcarbamate	10000	0.53
68412-54-4	Poly(oxy-1,2-ethanediyl), α -(nonylphenyl)- ω -hydroxy-, branched	10000	0.50
108-90-7	Chlorobenzene	10000	0.49
302-01-2	Hydrazine	10000	0.44
75-12-7	Formamide	10000	0.44
7439-96-5	Manganese	10000	0.44
134-32-7	alpha-Naphthylamine	10000	0.44
Arsenic	Arsenic Compounds	10000	0.33
Beryllium	Beryllium Compounds	10000	0.28

Thallium	Thallium Compounds	10000	0.28
7782-49-2	Selenium	10000	0.26
122-39-4	Diphenylamine	10000	0.22
541-73-1	1,3-Dichlorobenzene	10000	0.22
10034-93-2	Hydrazine sulfate	10000	0.22
91-22-5	Quinoline	10000	0.22
7440-66-6	Zinc (fume or dust)	10000	0.22
100-01-6	p-Nitroaniline	10000	0.22
556-52-5	Glycidol	10000	0.22
62-56-6	Thiourea	10000	0.22
104-94-9	p-Anisidine	10000	0.22
95-54-5	1,2-Phenylenediamine	10000	0.22
135-20-6	Cupferron	10000	0.22
3173-72-6	1,5-Naphthalene diisocyanate	<10000	0.22
78560-44-8	Silane, trichloro(3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10- heptadecafluorodecyl)-	100	0.22
107-05-1	Allyl chloride	10000	0.21
75-56-9	Propylene oxide	10000	0.19
107-13-1	Acrylonitrile	10000	0.18
7440-22-4	Silver	10000	0.16
8002-05-9	Petroleum	<100	0.14
94-36-0	Benzoyl peroxide	10000	0.13
554-13-2	Lithium carbonate	10000	0.11
7440-47-3	Chromium	10000	0.11
1120-71-4	Propane sultone	10000	0.11
624-18-0	1,4-Phenylenediamine dihydrochloride	10000	0.11
357-57-3	Brucine	10000	0.07
109-06-8	2-Methylpyridine	10000	0.05
123-38-6	Propionaldehyde	10000	0.04
72-57-1	Trypan blue	10000	0.04
1313-27-5	Molybdenum trioxide	10000	0.03
77-78-1	Dimethyl sulfate	10000	0.01
120-12-7	Anthracene	10000	0.01
989-38-8	C.I. Basic Red 1	10000	0.01
106-50-3	p-Phenylenediamine	10000	0.01
Strychnine and salts	Strychnine and Salts	10000	0.01
118-74-1	Hexachlorobenzene	10	0.00
20325-40-0	3,3'-Dimethoxybenzidine dihydrochloride	10000	0.00
63-25-2	Carbaryl	10000	0.00
110-82-7	Cyclohexane	10000	0.00

100-42-5	Styrene	10000	0.00
19044-88-3	Oryzalin	10000	0.00
51-79-6	Urethane	10000	0.00
121-14-2	2,4-Dinitrotoluene	10000	0.00
606-20-2	2,6-Dinitrotoluene	10000	0.00

APPENDIX B:
Form R for DOE (Lead)

APPENDIX C:
FORM R FOR LANL (LEAD)

