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December 2024

Emissions Inventory Report Summary for Los Alamos National Laboratory for Calendar Year 2023

Prepared by the Environmental Protection Division

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Acronyms and Terms

AIRS	Aerometric Information Retrieval System
AQB	Air Quality Bureau
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CMRR	Chemistry and Metallurgy Research Replacement (Facility)
CO	carbon monoxide
EPA	United States Environmental Protection Agency
FGR	flue gas recirculation
gal.	gallon
HAP	hazardous air pollutant
LANL	Los Alamos National Laboratory
lb	pound
MMBTU/hr	1,000,000 British thermal units per hour
mmHg	millimeter of mercury
MSDS	material safety data sheet
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NO _x	nitrogen oxides
oz.	ounce
PM	particulate matter
PM _{2.5}	particulate matter with diameter less than 2.5 micrometers
PM ₁₀	particulate matter with diameter less than 10 micrometers
PSD	Prevention of Significant Deterioration
R&D	research and development
RLUOB	Radiological Laboratory/Utility/Office Building
SO _x	sulfur oxides
SO ₂	sulfur dioxide
TA	Technical Area
TSP	total suspended particulates
µm	micrometer
VOC	volatile organic compound
yr	year

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EMISSIONS INVENTORY REPORT SUMMARY FOR LOS ALAMOS NATIONAL LABORATORY FOR CALENDAR YEAR 2023

by
Environmental Protection and Compliance Group

ABSTRACT

Los Alamos National Laboratory (LANL) is subject to annual emissions reporting requirements for regulated air pollutants under Title 20 of the New Mexico Administrative Code, Chapter 2, Part 73 (20.2.73 NMAC), Notice of Intent and Emissions Inventory Requirements. The applicability of the requirements is based on LANL's potential to emit 100 tons per year of suspended particulate matter, nitrogen oxides, carbon monoxide, sulfur oxides, or volatile organic compounds. Additionally, on April 30, 2004, LANL was issued a Title V Operating Permit from the New Mexico Environment Department/Air Quality Bureau, under 20.2.70 NMAC and the permit was revised on October 2, 2023. This Title V Operating Permit (Permit No. P100-R2M5) includes emission limits and operating limits for all regulated sources of air pollution at LANL. The Title V Operating Permit also requires semi-annual emissions reporting for all sources included in the permit. This report summarizes both the annual emissions inventory reporting and the semi-annual emissions reporting for LANL for calendar year 2023. LANL's 2023 emissions are well below the emission limits in the Title V Operating Permit.

1.0 INTRODUCTION

1.1 Regulatory Basis

Los Alamos National Laboratory (LANL or the Laboratory) has reported on air pollutants generated from its operations since the 1970s when Air Quality Control Regulation 703, Registration of Air Contaminant Sources, was promulgated. According to the regulation, the Laboratory was required to register air pollutant sources that emitted more than 2,000 lbs per year of any air contaminant. This regulatory requirement later evolved into Title 20 of the New Mexico Administrative Code, Chapter 2, Part 73 (20.2.73 NMAC), Notice of Intent and Emissions Inventory Requirements. The objective of the reporting requirement is to provide emissions data to the New Mexico Environment Department (NMED)/Air Quality Bureau (AQB) so its staff can determine whether LANL meets state and federal air pollutant standards.

Annual emissions inventory reporting requirements under 20.2.73 NMAC apply to any stationary source that

- has been issued a construction permit under 20.2.72 NMAC;
- has been required to file a Notice of Intent under 20.2.73.200 NMAC; or
- emits in excess of
 - 1 ton per year of lead or
 - 10 tons per year of

- total suspended particulates (TSP),
- particulate matter (PM) with diameter less than 10 micrometers (PM₁₀),
- PM with diameter less than 2.5 micrometers (PM_{2.5}),
- sulfur dioxide (SO₂),
- nitrogen oxides (NO_x),
- carbon monoxide (CO), or
- volatile organic compounds (VOCs).

The annual emissions inventory must be submitted to NMED/AQB by April 1 of each year. The NMED/AQB enters the data into the Aerometric Information Retrieval System (AIRS). This nationwide system, administered by the United States Environmental Protection Agency (EPA), is used to help ensure that ambient air quality standards are maintained and to track the state's air pollutant emissions. AIRS is a large air pollution database that contains information, requirements, and data on air pollution and air quality in the United States and various World Health Organization member countries. The program is operated by the EPA and state/local air pollution control agencies. The AIRS database tracks each state's progress towards achieving and maintaining National Ambient Air Quality Standards for criteria pollutants. The database is also used as a tool to help improve each state's air quality programs by enabling program members to access and compare past data and view data from other states.

Additionally, on April 30, 2004, LANL was issued a Title V Operating Permit from the NMED/AQB, under 20.2.70 NMAC. The NMED/AQB issued a revised permit (P100-R2M5; NMED 2023) on October 2, 2023 (NMED 2023 a). A condition of the Title V Operating Permit is that LANL must submit semi-annual emissions reports to NMED documenting that emissions from all permitted sources are below permitted emission levels. Section A109.B of the permit states:

“A Semi-Annual Report of actual emissions from all permitted sources unless otherwise specified in this permit is due within 90 days following the end of every 6-month reporting period as defined at Condition A109.A. Emission estimates of criteria pollutants NO_x, CO, SO₂, VOC, PM₁₀, and PM_{2.5} shall not include fugitive emissions. Emissions estimates of HAPs shall include fugitive emissions. Emission estimates shall not include Insignificant or Trivial Activities, except that facility-wide emissions from all natural gas combustion sources shall be estimated. The reports shall include a comparison of actual emissions that occurred during the reporting period with the facility-wide allowable emission limits at Table 106.B.”

In 2004, the Laboratory began submitting the semi-annual emissions reports as well as the annual emissions inventory. There are a few differences in which sources are included in the two emissions reports. These differences are explained in the following sections.

1.2 Contents of Annual Emissions Inventory Submittal

NMED requested that LANL submit annual emissions inventory data for 2023 via online reporting tool, AEIR, for entry into AIRS. The information required for submittal includes the following:

- facility name, organization name, and agency ID;
- facility contact information;
- signed certification statement by a responsible facility official; and
- specific information for each emission unit such as fuel type, materials processed, materials consumed, fuel heating value, percent sulfur of fuel, percent ash of fuel, percent carbon content, and details of operating schedule.

This annual emissions inventory submittal includes air pollutant data for PM, PM₁₀, PM_{2.5}, CO, NO_x, sulfur oxides (SO_x), VOCs, hazardous air pollutants (HAPs), and greenhouse gases (GHG).

1.3 Contents of the Semi-Annual Title V Operating Permit Emissions Reports

The Semi-Annual Title V Operating Permit Emissions Reports include actual estimated emissions for the reporting period for each emission source or source category included in the Title V Operating Permit. For each source category, the actual emissions are compared with emission limits listed in the permit.

The emissions are calculated using operating data from logbooks and records maintained on site.

All emission calculations are consistent with calculation methods used for the annual emissions inventory.

For the first Title V permit, the Laboratory requested emission limits in their Title V Operating Permit for two source categories that are considered insignificant sources for the annual emissions inventory. These source categories are 1) small boilers and heaters and 2) stationary standby generators. LANL requested emission limits for these source categories to obtain federally enforceable limits that would keep the Laboratory under the major source threshold for Prevention of Significant Deterioration (PSD) applicability (20.2.74 NMAC). LANL's actual emissions from these insignificant sources have historically been very low; however, without federally enforceable limits on their operation, the potential to emit from these sources was quite high. To demonstrate that LANL is below the PSD applicability and is in compliance with the emission limits placed on these emission sources for the original Title V Operating Permit, LANL included these emissions in the semi-annual emissions reports. NMED removed the stationary standby generators starting with the P100-R2 permit.

2.0 REPORTED EMISSION SOURCES

Table 2.0-1 shows the emission sources included in the Laboratory's 2023 annual emissions inventory (LANL 2023a) and the 2023 semi-annual emissions reports (LANL 2023b and 2023c). The source categories and the methodology used to calculate emissions are described in the following sections.

The following subsections describe emission sources included in the 2023 emissions inventory and semi-annual emissions reports and emission calculation methodology for each source type. A summary table of actual reported emissions by source is included in Section 2.12. Attachment A includes worksheets showing detailed emission calculations for individual emissions sources. A copy of the 2023 emissions inventory as submitted to NMED is presented in Attachment B. The 2023 semi-annual emissions reports are included as Attachment C.

Table 2.0-1. Sources Included in LANL’s 2023 Annual Emissions Inventory and Semi-Annual Emissions Reports

Included in Annual Emissions Inventory	Included in Semi-Annual Emissions Reports	Comment
Power Plant (TA-3)	Power Plant (TA-3)	n/a ^a
Boilers greater than 5 MMBTU/hr ^b (15 units)	All small and large boilers and heaters (approximately 200 units)	Small boilers less than 5 MMBTU/hr are exempt from annual emissions inventory requirements (see Section 3.1).
Asphalt Plant	Asphalt Plant	n/a
n/a	Degreasers	The degreasers were removed from the Annual Emissions Inventory source list starting in 2018.
Data Disintegrator	Data Disintegrator	n/a
Permitted Beryllium Sources	Permitted Beryllium Sources	n/a
Facility-Wide Chemical Use	Facility-Wide Chemical Use	The Semi-Annual Emissions Reports also include separate emission data for the CMRR-RLUOB building.
Process Generators	Process Generators	n/a
Stationary Standby Generators	n/a	The stationary standby generators were removed from the Title V permit in 2015.
TA-3 Turbine	TA-3 Turbine	n/a
Evaporative Sprayers	Evaporative Sprayers	n/a

^a n/a = not applicable.

^b one million British thermals units per hour.

2.1 Power Plant

The Laboratory operates a power plant at Technical Area (TA) 3. The power plant produces steam for heating and electricity for much of the Laboratory when sufficient power from outside sources is not available. The heat produced from the power plant is used for comfort heat and hot water and to support facility processes. The power plant has three boilers that are fueled primarily with natural gas with No. 2 fuel oil as a backup.

For the 2023 emissions inventory, NMED requested that emissions from natural gas and No. 2 fuel oil be reported separately for the boilers located at each boiler located at the power plant. The TA-3 power plant was originally included in LANL’s emissions inventory as a single unit. When a modification to the plant was made in 2001, the TA-3 power plant was separated into three separate units for emissions reporting purposes. Because each of the three boilers has the capability of burning either natural gas or No. 2 fuel oil, the TA-3 power plant is now reported as six units (EQPT-24, EQPT-25, and EQPT-26 for the natural gas and EQPT-137, EQPT-138, and EQPT-141 for the No. 2 fuel oil).

Actual estimated emissions are calculated on the basis of metered fuel consumption and emission factors. The primary source of emission factors is AP-42, the EPA’s Compilation of Air Pollutant Emission

Factors (EPA 1998). However, emission factors from stack tests conducted at the TA-3 power plant when burning natural gas were also used, as appropriate.

The TA-3 power plant has historically been the largest source of NO_x emissions at the Laboratory. In 2002, a voluntary project to install pollution control equipment on the three boilers at the TA-3 power plant was completed. The three boilers were fitted with flue gas recirculation (FGR) equipment to reduce NO_x emissions. Stack testing for NO_x and CO was conducted before FGR equipment was installed and again after it was operational. Based on these stack test results, FGR reduced NO_x emissions by approximately 64%. Figure 2.1-1 shows a picture of the TA-3 power plant building and stacks.



Figure 2.1-1. TA-3 power plant

2.2 Small Boilers and Heaters

The Laboratory operates approximately 200 small boilers and heaters, used primarily for seasonal comfort heat. Most of the boilers are exempt from permitting requirements because of their small size and use as comfort boilers and are not included in the annual emissions inventory. The exemption analysis applied to boilers is discussed in Section 3.1 of this report.

The boilers that are not exempt and reported in the 2023 annual emissions inventory include:

- two boilers at TA-53 (EQPT-11 and EQPT-12),
- two boilers at TA-55 (EQPT-29 and EQPT-30),
- five boilers at the Chemistry and Metallurgy Research Replacement (CMRR) Facility (EQPT-90, EQPT-104, EQPT-105, EQPT-106, and EQPT-107), and
- two boilers at TA-16 (EQPT-53 and EQPT-134).

All of the reported boilers burn natural gas. Operating logs of actual fuel used for the TA-55 and the CMRR boilers were used to quantify emissions from these units. Fuel use for all other boilers was estimated based on the total amount of natural gas used by the Laboratory minus the amount supplied to metered sources. The amount of natural gas left after subtracting out metered sources was apportioned to the various boilers based on their size. Since virtually all of the small boilers are seasonal boilers used for building heating, it was assumed they would all operate approximately the same amount of time over the

course of the year. Some emission factors were available from stack tests (TA-55), some were provided by the boiler manufacturer (Sellers Engineering Company), and the rest were taken from AP-42 (EPA 1998). Copies of spreadsheets showing fuel use and emission factors for each boiler are included in Attachment A.

For the semi-annual emissions reports, emissions from small boilers are included as a source category. These boilers include TA-16-1484-BS-1, TA-16-1484-BS-2, TA-53-365-BHW-1, TA-53-365-BHW-2, TA-55-6-BHW-1, TA-55-6-BHW-2, CMRR-BWH-1, CMRR-BWH-2, CMRR-BWH-3, and CMRR-BWH-4. Additionally, emissions from each of the CMRR boilers are included as separate source categories. To estimate emissions, all unmetered fuel use was multiplied by AP-42 emission factors for small boilers burning natural gas (EPA 1998). Total emissions of each pollutant from all boilers and heaters in this source category were then summed and reported on the semi-annual emissions reports.

2.3 Asphalt Plant

The ADM asphalt plant (Area-5) began operations in June 2023. This unit replaced the old asphalt plant (EQPT-116). In December of 2022, LANL received a new General Construction Permit (GCP3-2195G) to run the new asphalt plant.

2.4 Data Disintegrator

The data disintegrator is included in the 2023 emissions inventory as EQPT-89. Operation of this source started in August 2004. Emissions are calculated using the methodology described in the original permit application dated June 23, 2003. Emissions of PM, PM₁₀, and PM_{2.5} are calculated based on the number of boxes shredded, the amount of dust estimated to enter the exhaust (provided by the manufacturer), and the control efficiency of the cyclone and baghouse (also provided by the manufacturer). The permit application included PM_{2.5} emission estimates. Therefore, an emission methodology had to be developed for the emission inventory reporting. No specific PM size distribution data were available. However, the manufacturer reported that dust into the exhaust would be in the size range of 5 to 20 μm. Based on visual observation and engineering judgment, a particle size distribution in the exhaust was estimated as follows:

- PM_{2.5} 15%
- PM₁₀ 90%
- TSP 100%

The number of boxes of material shredded is provided in a monthly data deliverable from the site support contractor. The total number of boxes shredded at the data disintegrator in 2023 was 4,937.

2.5 Degreasers

The halogenated solvent cleaning machine at TA-55 has a capacity of 18 liters and is registered with NMED/AQB as required under the National Emissions Standards for Hazardous Air Pollutants, 40 Code of Federal Regulations (CFR) 63 Subpart T, Halogenated Solvent Cleaning. The solvent used in the machine, trichloroethylene (Chemical Abstracts Service [CAS] No. 79-01-6), is a VOC and a HAP. LANL uses a mass balance approach to estimate emissions. Logbooks are kept on the amount of solvent added and removed from the machine. Additionally, solvent levels in the machine are logged monthly. LANL has two additional halogenated solvent cleaning machines registered with NMED which were not

operational in 2023. The emissions from the TA-55 degreaser for this reporting period are 77.53 lbs or 0.039 tons per year. This source category is reported only in the semi-annual emissions reports.

2.6 Permitted Beryllium-Machining Operations

The Laboratory operates five permitted beryllium-machining operations that are subject to 40 CFR 61, Subpart C, and National Emission Standards for Beryllium. Emissions reported for the Beryllium Test Facility (ACT-3) are from actual stack emissions measurements. Emissions for the Target Fabrication Facility (ACT-2) are from initial compliance stack testing and are reported as permitted emission levels. In addition, emissions from the Plutonium Facility (ACT-6) are reported at permitted emission levels. Foundry operations within the Plutonium Facility did not occur during this reporting period. The Sigma Facility (ACT-41) includes emissions from electroplating, chemical milling, and metallographic operations. Total emissions from all permitted beryllium operations are included in the semi-annual emissions reports.

2.7 Generators

LANL has 11 permitted internal combustion engines including: four generators located at TA-33, three generators located at CMRR Radiological Laboratory/Utility/Office Building (RLUOB), three generators located at TA-55, and one generator located at TA-48. The original TA-33 generator was installed in May 2006 and replaced in December 2014 by a Cummins Portable Diesel Generator. The Cummins generator (EQPT-146) operated for 29.5 hours in 2023. Permit No. 2195-P was issued in August 2007 for three more units at TA-33 (EQPT-119, EQPT-120, EQPT-135); the three units operated for a total of 12.2 hours in 2023.

LANL has three permitted generators (EQPT-128, EQPT-153, EQPT-154) located at the RLUOB facility, which began operating in 2012. The generators were added to the newest Title V Operating Permit and included in both the semi-annual emissions report and emissions inventory report. The three generators operated for a total of 26.8 hours in 2023.

The other four permitted generators at LANL are located at TA-55 (EQPT-143, EQPT-155, EQPT-156) and TA-48 (EQPT-147). The TA-55 generators operated for a total of 44.1 hours in 2023 and the TA-48 generator did not operate.

The Laboratory maintains approximately 30 stationary standby generators that are considered exempt sources under the Construction Permit regulations (20.2.72.202.b NMAC). These sources are included in LANL's annual emissions inventory report, but not in the semi-annual emissions report. All stationary standby generators at LANL are tested on a routine schedule to ensure they are operational and will function properly if needed. All units are equipped with hour meters to document how many hours they are used. The Laboratory maintains records on a semi-annual basis to document hour meter readings. The number of hours each generator is used in a reporting period is multiplied by AP-42 emission factors for diesel-fired internal combustion engines or natural-gas-fired internal combustion engines (EPA 1996). Emissions are then summed for each pollutant and reported on the semi-annual emissions reports for this source category.

2.8 Combustion Turbine

LANL has one combustion turbine located at the TA-3 power plant (EQPT-112). A revised construction permit was issued by NMED July 2004 to add the TA-3 combustion turbine as a new permitted source. This unit started operations in September 2007. Emission calculations are based on the stack compliance tests performed in 2011, AP-42 Tables 3.1-2a and 3.1-3, and information provided by the manufacturer. In 2023, this combustion turbine operated for 4,859 hours.

2.9 Emissions from Chemical Use Activities

A significant amount of the Laboratory's work is devoted to research and development (R&D) activities. Varying operating parameters, as well as amounts and types of chemicals, are used in these activities. R&D activities occur at virtually all technical areas within the Laboratory, typically in small quantities in laboratory settings. Figure 2.9-1 shows a typical laboratory at LANL where chemicals are used.



Figure 2.9-1. Example of a laboratory fume hood at LANL

For the purposes of annual emissions inventory reporting, one equipment number has been assigned for all R&D chemical use (ACT-7). Facility-wide chemical use emissions are reported on both the annual emissions inventory and the semi-annual emissions reports. The methods used to quantify emissions of VOC and HAPs from R&D activities are discussed below.

2.9.1 VOC Emissions

The Laboratory tracks chemical purchases through a facility-wide chemical tracking system called ChemDB. A download from the ChemDB inventory system was created that included all chemical containers added to LANL's inventory between January 1, 2023, and December 31, 2023. This dataset included 54,529 separate line items of chemicals purchased.

The dataset was reviewed electronically to identify all VOCs purchased and received at LANL in 2023. With the exception of specific listed chemicals, VOCs are any compounds of carbon that participate in

atmospheric photochemical reactions. VOCs include commonly used chemicals such as ethanol, methanol, trichloroethylene, and isopropanol. The general assumption used in estimating VOC emissions from chemical use is:

$$\text{Purchasing} = \text{Use} = \text{Emissions}$$

From the dataset of chemicals purchased in 2023, certain categories of chemicals were separated and eliminated from the analysis. The classifications assigned and corresponding reasons (noted in parentheses) for exclusion of chemicals from inventory records are noted below.

- Solid materials (not a significant source of air emissions based on their low vapor pressure)
- Non-VOC materials as defined by 40 CFR 51.100 (specific chemicals in 40 CFR 51.100 are listed as having negligible photochemical reactivity and are exempt from the definition of VOC)
- Paints (paints were evaluated separately—see Section 3.5)
- Inorganic chemicals (inorganics are not compounds of carbon)
- Oils (not a significant source of air emissions based on low vapor pressure and primarily used for maintenance)
- Fuels used for combustion purposes (emissions from fuel combustion are reported for each combustion unit)

The following categories of chemicals were eliminated based on guidance from NMED (NMED 2001).

- Container sizes of 1 lb or less
- Chemicals with vapor pressures less than 10 mmHg
- Chemicals used to calibrate equipment
- Maintenance chemicals
- Use of office equipment and products
- Chemicals used for boiler water treatment operations
- Chemicals used for oxygen scavenging (deaeration) of water
- Chemicals used in bench-scale chemical analysis¹

After the elimination of chemicals and categories of chemicals listed above, the remaining chemical inventory records were matched with a list of known VOCs by CAS number. For mixtures (chemicals without CAS numbers), material safety data sheets (MSDSs) were reviewed to determine if any VOCs were present and, if so, to determine the associated percent volatile. As a conservative estimate, VOCs identified in ChemDB records were assumed to be 100% emitted to air. Estimated emissions of VOCs from chemical use in 2023 totaled 10.33 tons.

¹ This exemption was applied only to biological research solutions. Otherwise, this exemption was not applied (see Table 3.3-1).

2.9.2 HAP Emissions

Section 112(b) of the 1990 Clean Air Act Amendments listed 188 unique HAPs identified for potential regulation by the EPA. In 1995, caprolactam was delisted as a HAP, and methyl ethyl ketone was delisted in 2005. Of the remaining 187 listed HAPs, 17 are classes of compounds (e.g., nickel compounds). Use of the 188 listed chemicals in activities at the Laboratory was evaluated and quantified for the annual emissions inventory submittal to NMED.

The ChemDB inventory system 2023 dataset was analyzed to identify HAPs. The identification process was similar to that used for VOCs. Pure chemicals (i.e., chemicals with CAS numbers), classes of compounds, and mixtures were evaluated to determine if the chemicals themselves were HAPs or if they contained HAP constituents. For mixtures, MSDSs were reviewed to determine if any HAPs were present and, if so, to determine the associated HAP percentages. Listed below are certain chemical types or categories that were identified and removed from this analysis (refer to Section 2.9.1 and Table 3.3-1 for explanations on removal of these chemicals).

- Paints
- Maintenance chemicals
- Chemicals used to calibrate equipment
- Container sizes of 1 lb or less
- Chemicals used in bench-scale chemical analysis
- Use of office equipment and products
- Chemicals used for boiler water treatment operations
- Chemicals used for oxygen scavenging (deaeration) of water

Total HAP emissions were estimated by summing 1) pure HAP chemicals, 2) classes of compounds that are HAPs, and 3) the HAP constituents from mixtures. The resulting total amount of HAPs from chemical use reported for 2023 was 4.27 tons.

The HAP emissions reported generally reflect quantities procured in the calendar year. In a few cases, procurement values and operational processes were further evaluated so that actual air emissions could be reported instead of procurement quantities. Additional analyses for certain metals and acids were performed and are described below.

2.10 Evaporative Sprayers

The Laboratory is permitted to operate six spray evaporators at the Sanitary Effluent Treatment Facility or SERF. The spray evaporators are intended to reduce water volume in the existing Sigma Mesa evaporation basins. These synthetically-lined evaporation basins are located within TA-60. The basins are intended for use to evaporate a specific treated waste water discharge from SERF which processes treated sanitary wastewater effluent for beneficial reuse, and is intended to conserve potable water and reduce wastewater discharges to the environment. The stored treated waste water is a concentrated salt solution from reverse osmosis treatment at the SERF facility. Operation of the SERF facility is crucial in reducing water usage at LANL, achieving compliance with discharges to an NPDES outfall, and providing clean water for cooling tower use at LANL.

Actual estimated emissions are calculated from hours of operation and emission factors based on analytical results from sampling the basin water.

The evaporative sprayers did not operate in 2023.

2.11 Emissions Summary by Source

Table 2.10-1 provides a summary of LANL’s 2023 actual emissions, as submitted for the annual emissions inventory. The table presents emissions by pollutant and by source, with a facility total at the bottom of the table. Attachment A provides detailed information on how emissions were calculated for each emission unit.

Table 2.10-1. Summary of LANL 2023 Reported Emissions for Annual Emissions Inventory

	NO _x (tons/yr)	SO _x (tons/yr)	TSP (tons/yr)	PM ₁₀ (tons/yr)	PM _{2.5} (tons/yr)	CO (tons/yr)	VOC (tons/yr)	HAPs (tons/yr)
TA-3 Power Plant Boilers	9.49	0.10	1.25	1.25	1.25	6.54	0.91	0.31
TA-55-6 Boilers	1.03	0.007	0.08	0.08	0.08	0.87	0.06	0.02
TA-53 Boilers	0.81	0.005	0.06	0.06	0.06	0.68	0.04	0.02
TA-16 Boilers	0.27	0.004	0.05	0.05	0.05	0.27	0.04	0.01
RLUOB Boilers	0.05	0.001	0.008	0.008	0.008	0.06	0.04	0.003
Asphalt Plant	0.03	0.01	0.08	0.05	0.05	0.26	0.08	0.01
Data Disintegrator	n/a	n/a	0.21	0.19	0.13	n/a	n/a	n/a
R&D Chemical Use	n/a	n/a	n/a	n/a	n/a	n/a	10.33	4.27
TA-33 Generators	0.40	0.01	0.02	0.02	n/a	0.08	0.03	0.0001
RLUOB Generators	0.45	0.01	0.03	0.02	n/a	0.56	0.06	0.0001
TA-55 Generators	0.80	0.01	0.03	0.03	n/a	0.18	0.03	0.0001
TA-48 Generator	0	0	0	0	n/a	0	0	0
Stationary Standby Generators	2.57	0.09	0.12	n/a	n/a	0.58	0.12	0.0008
TA-3 Turbine	45.81	3.24	3.67	3.67	3.67	55.80	1.19	0.70
Evaporative Sprayers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0
TOTAL	61.7	3.5	5.6	5.4	5.3	65.9	12.9	5.3

* n/a = not applicable

Table 2.10-2 provides a summary of 2023 emissions as reported on the semi-annual emissions reports required by the Title V Operating Permit. Attachment A provides detailed information on how emissions were calculated for each emission source category.

Table 2.10-2. Summary of LANL 2023 Semi-Annual Emissions as Reported Under Title V Operating Permit Requirements

	NO _x (tons/yr)	SO _x (tons/yr)	TSP (tons/yr)	PM ₁₀ (tons/yr)	PM _{2.5} (tons/yr)	CO (tons/yr)	VOC (tons/yr)	HAPs (tons/yr)
TA-3 Power Plant Boilers	9.49	0.10	1.25	1.25	1.25	6.54	0.91	0.31
Small Boilers	17.03	0.11	1.33	1.33	1.33	14.36	1.00	0.33
RLUOB Boilers	0.05	0.001	0.008	0.008	0.008	0.06	0.04	0.003
Asphalt Plant	0.03	0.01	0.08	0.05	0.05	0.26	0.08	0.01
Data Disintegrator	n/a	n/a	0.21	0.19	0.13	n/a	n/a	n/a
Degreaser	n/a	n/a	n/a	n/a	n/a	n/a	0.04	0.04
R&D Chemical Use	n/a	n/a	n/a	n/a	n/a	n/a	10.33	4.27
TA-33 Generators	0.40	0.01	0.02	0.02	n/a	0.08	0.03	0.0001
RLUOB Generators	0.45	0.01	0.03	0.02	n/a	0.56	0.06	0.0001
TA-55 Generators	0.80	0.01	0.03	0.03	n/a	0.18	0.03	0.0001
TA-48 Generator	0	0	0	0	n/a	0	0	0
TA-3 Turbine	45.81	3.24	3.67	3.67	3.67	55.80	1.19	0.70
Evaporative Sprayers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
TOTAL*	74.0	3.5	6.6	6.5	4.9	77.8	13.7	5.7

* The Small Boilers include emissions from the RLUOB Boilers. In order to avoid double counting emissions, the Totals do not include emissions from the RLUOB Boilers.

3.0 REPORTING EXEMPTIONS

Specific activities that are determined to be insignificant under NMED's Operating Permit program (20.2.70 NMAC) are exempt from reporting under the emissions inventory requirements (20.2.73.300 NMAC). NMED has designated exempt sources, activities, or thresholds in the following lists:

- List of Insignificant Activities, March 25, 2005 (NMED 2005)
- List of Trivial Activities, January 10, 1996 (NMED 1996).

Laboratory sources and activities that qualify as insignificant or trivial as specified in these lists are not included in the annual emissions inventory. The following subsections of this report provide information and examples of the Laboratory's exempt activities as well as analyses performed to determine exempt status.

3.1 Boilers

The Laboratory's boiler inventory was evaluated against the List of Insignificant Activities (NMED 2005). Specifically, boilers were exempted from emissions inventory reporting requirements if they met one of the following requirements:

- Fuel-burning equipment that uses gaseous fuel has a design rate less than or equal to 5 MMBTU/hr, and is used solely for heating buildings for personal comfort or for producing hot water for personal use, or

- Any emissions unit . . . that has the potential to emit no more than 1 ton/yr of any regulated pollutant .

Any boiler that was not used exclusively for comfort heating or hot water was evaluated for the 1 ton per year exemption. For purposes of determining exemptions, boiler design ratings were used to estimate potential to emit. Any boiler not qualifying for one of these two exemptions is included in the annual emissions inventory with its own unique equipment number.

For the semi-annual emissions reports, emissions from all boilers and heaters were summed and reported for the entire source category.

3.2 Generators

The Laboratory maintains an inventory of approximately 73 portable generators. Portable generators are used at the Laboratory for temporary operations requiring remote power or to provide emergency backup power during power outages at various sites. The portable generators are fueled by gasoline and/or diesel fuel.

In addition to portable generators, the Laboratory maintains and operates approximately 30 stationary standby generators. Stationary generators are used on standby (emergency) status to provide power to critical systems at the Laboratory during power outages. The stationary generators are fueled by natural gas, propane, gasoline, or diesel.

The insignificant activity exemptions applicable to the Laboratory's generators are for:

- Portable engines and portable turbines that have a design capacity less than or equal to a
 - 200-horsepower engine if fueled by diesel or natural gas and a
 - 500-horsepower engine if fueled by gasoline.
- Emergency generators that on a temporary basis replace equipment used in normal operation, and which either have an allowable emission rate or potential to emit for each pollutant that is equal to or less than the equipment replaced, or which do not operate for a period exceeding 500 hours per calendar year.

On the basis of size, portable generators used for temporary power at remote locations are exempt from emissions inventory reporting requirements. Further, LANL's small portable generators are considered trivial activities and are not included in the Title V Operating Permit or semi-annual emissions reports. All stationary generators are designated as standby equipment under the Operating Permit Program and are used solely to provide emergency backup power for less than 500 hours per year. Therefore, they are considered insignificant sources and are also exempt from annual emissions inventory reporting requirements. However, the stationary standby generators were voluntarily included as a source category in the Title V Operating Permit and are included in the semi-annual emissions reports.

3.3 VOC Emissions

A number of insignificant and trivial activities were applicable for exempting materials from the VOC chemical use total in the emissions inventory. The basis of the exemptions and corresponding insignificant or trivial activities are explained in Table 3.3-1.

Fuels such as propane, kerosene, and acetylene were analyzed separately and are not listed in Table 3.3-1. When fuels are burned in an open flame, almost all of the fuels are consumed and VOC emissions are minimal. Emissions from fuel combustion are accounted for by using emission factors for each fuel-burning unit.

Table 3.3-1. Exemptions Applied for Chemical Use Activities

Basis of Exemption	Activity Type	Activity
Container sizes of 1 lb or less	Trivial	Paint or nonpaint materials dispensed from prepackaged aerosol cans of 16-oz. capacity or less.
Chemicals with vapor pressures less than 10 mmHg	Insignificant	Any emissions unit, operation, or activity that handles or stores a liquid with vapor pressure less than 10 mmHg or in quantities less than 500 gal.
Calibration chemicals	Trivial	Routine calibration and maintenance of laboratory equipment or other analytical instruments, including gases used as part of those processes.
Maintenance chemicals and oils	Trivial	Activities that occur strictly for maintenance of grounds or buildings, including lawn care; pest control; grinding; cutting; welding; painting; woodworking; sweeping; general repairs; janitorial activities; plumbing; re-tarring roofs; installing insulation; steam-cleaning and water-washing activities; and paving of roads, parking lots, and other areas. Activities for maintenance and repair of equipment, pollution-control equipment, or motor vehicles either inside or outside of a building.
Use of office equipment and products	Trivial	Use of office equipment and products, not including printers or businesses primarily involved in photographic reproduction.
Chemicals used for boiler water treatment	Trivial	Boiler water treatment operations, not including cooling towers.
Chemicals used for oxygen scavenging	Trivial	Oxygen scavenging (deaeration of water).
Chemicals used in bench-scale chemical analysis	Trivial	Bench-scale laboratory equipment used for physical or chemical analysis but not lab fume hoods or vents. Note: This exemption was applied only to biological research solutions. Otherwise, this exemption was not applied.

3.4 HAP Emissions

The HAP chemical use exemption analysis, similar to the VOC chemical use exemption analysis, resulted in application of several of the same exemptions from NMED/AQB List of Insignificant Activities (NMED 2005) and List of Trivial Activities (NMED 1996) (refer to Table 3.3-1).

3.5 Paints

An analysis of VOC and HAP emissions resulting from painting activities at the Laboratory was performed to determine if certain exemptions apply. Paint information for 2023 was gathered from the ChemDB chemical inventory system. These records were evaluated for applicability of exemptions for trivial and insignificant activities.

The following exemptions from NMED/AQB Operating Permit Program List of Trivial Activities (NMED 1996) were used in the paint analysis:

- Activities that occur strictly for maintenance of grounds or buildings, including the following: lawn care; pest control; grinding; cutting; welding; painting; woodworking; sweeping; general repairs; janitorial activities; plumbing; re-tarring roofs; installing insulation; steam-cleaning and water-washing activities; and paving of roads, parking lots, and other areas.
- Activities for maintenance and repair of equipment, pollution control equipment, or motor vehicles either inside or outside of a building.
- Paint or nonpaint materials dispensed from prepackaged aerosol cans of 16 oz. or less capacity. The amount of paint that did not qualify for a Trivial Activity was totaled and it was verified the amount less than the 2-ton emission limit for insignificant activities.
- Surface coating of equipment, including spray painting and roll coating, for sources with facility-wide total cleanup solvent and coating actual emissions of less than 2 tons per year.

4.0 EMISSIONS SUMMARY

4.1 2023 Emissions Summary

Table 4.1-1 presents facility-wide estimated actual emissions of criteria pollutants for 2023 as reported in the annual emissions inventory and the semi-annual emissions reports. In addition, the Title V Operating Permit emissions limits are included. Table 4.1-2 presents estimated actual emissions for HAPs from chemical use. Emission unit information and detailed emissions calculations are included in Attachment A. The 2023 emissions inventory report as submitted to NMED is presented in Attachment B. Attachment C includes semi-annual emissions reports for 2023.

Table 4.1-1. LANL Facility-Wide Criteria Pollutant Emissions for 2023

Pollutant	Estimated Actual Emissions for Annual Emissions Inventory Reporting (tons/yr)	Estimated Actual Emissions for Semi-Annual Title V Operating Permit Reporting (tons/yr)	Title V Operating Permit Facility-Wide Emission Limits (tons/yr)
NO _x	61.7	74.0	245
SO _x	3.5	3.5	150
CO	65.9	77.8	225
PM	5.6	6.6	120
PM ₁₀	5.4	6.5	120
PM _{2.5}	5.3	4.9	120
VOC	12.9	13.7	200

Table 4.1-2. LANL HAP Emissions from Top Five Chemicals Used in 2023

Pollutant	Chemical Use HAP Emissions (tons/yr)
Hydrochloric Acid	0.67
Methanol	0.62
Methylene Chloride	0.47
Hexane	0.43
Cadmium Compounds	0.42
All other HAPs from Chemical Use	1.66
Total HAPs	4.27

HAP emissions from combustion sources are included in the emissions reports; however, they are negligible and do not contribute significantly to facility-wide HAP emissions.

Figure 4.1-1 shows criteria air pollutant emissions by source for 2023, excluding the very small emissions sources such as the data disintegrator, asphalt plant, degreasers, and evaporative sprayers. As the figure shows, the TA-3 power plant and the sum of emissions from small boilers and were the largest sources of CO and NO_x emissions in 2023. R&D chemical use was the largest source of VOC emissions.

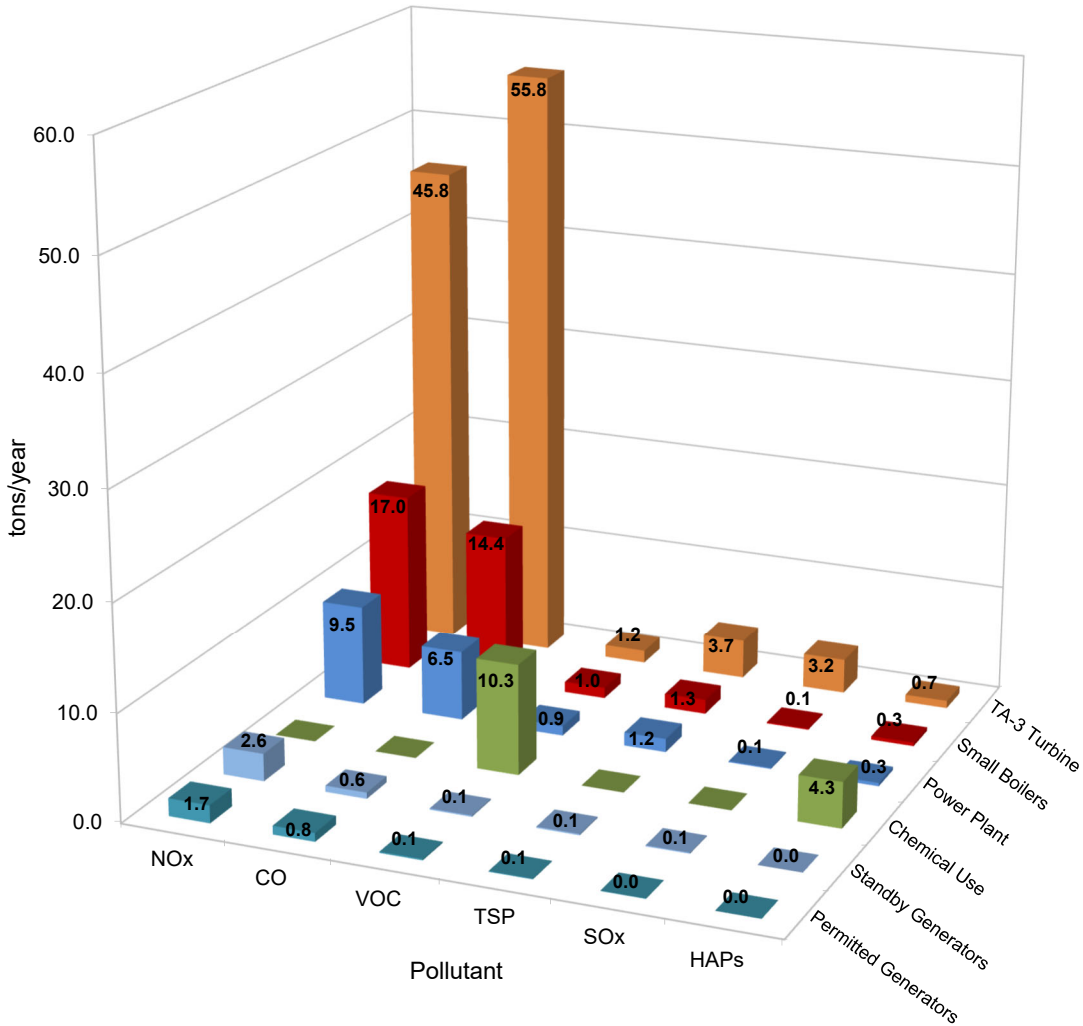


Figure 4.1-1. Emissions of criteria pollutants by source in 2023

Emission Trends and Title V Permit Limits

A comparison of historical emissions to the facility-wide emission limits in the Title V Operating Permit is provided in this section. It should be noted that the facility-wide emission limits in the Operating Permit include emissions from some sources that are not included in the annual emissions inventory, most notably small (insignificant) boilers and emergency standby generators. However, historical data are only available for emission sources that were included in the annual emissions inventory submittals.

Figure 4.1-2 provides a comparison of the past 10 years' facility-wide emissions for criteria air pollutants as reported to NMED in the annual emissions inventory submittal. The facility-wide emission limits included in LANL's Title V Operating Permit are also shown on the graph.

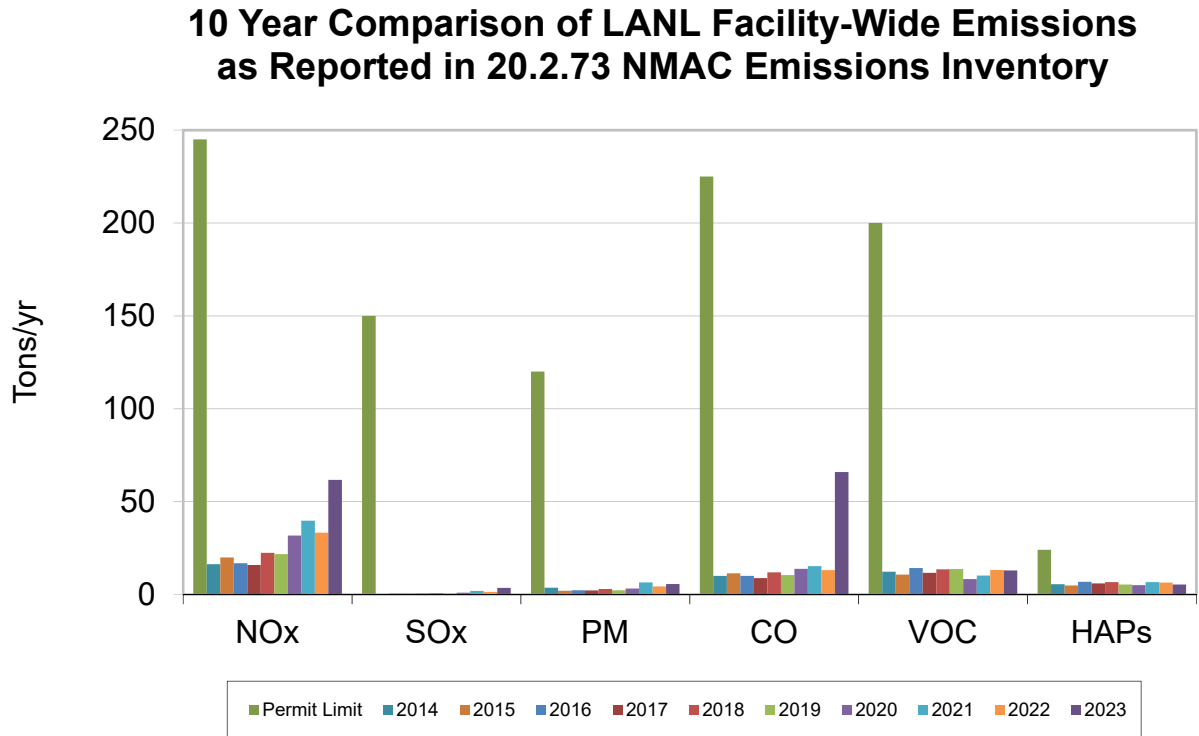


Figure 4.1-2. Comparison of facility-wide annual reported emissions from 2014 to 2023

Figure 4.1-3 presents VOC and HAP emissions from chemical use activities for the last 10 years. The continued fluctuation in both VOC and HAP emissions is due to both variations in actual chemical purchases and improvements the Laboratory has made to the chemical tracking system.

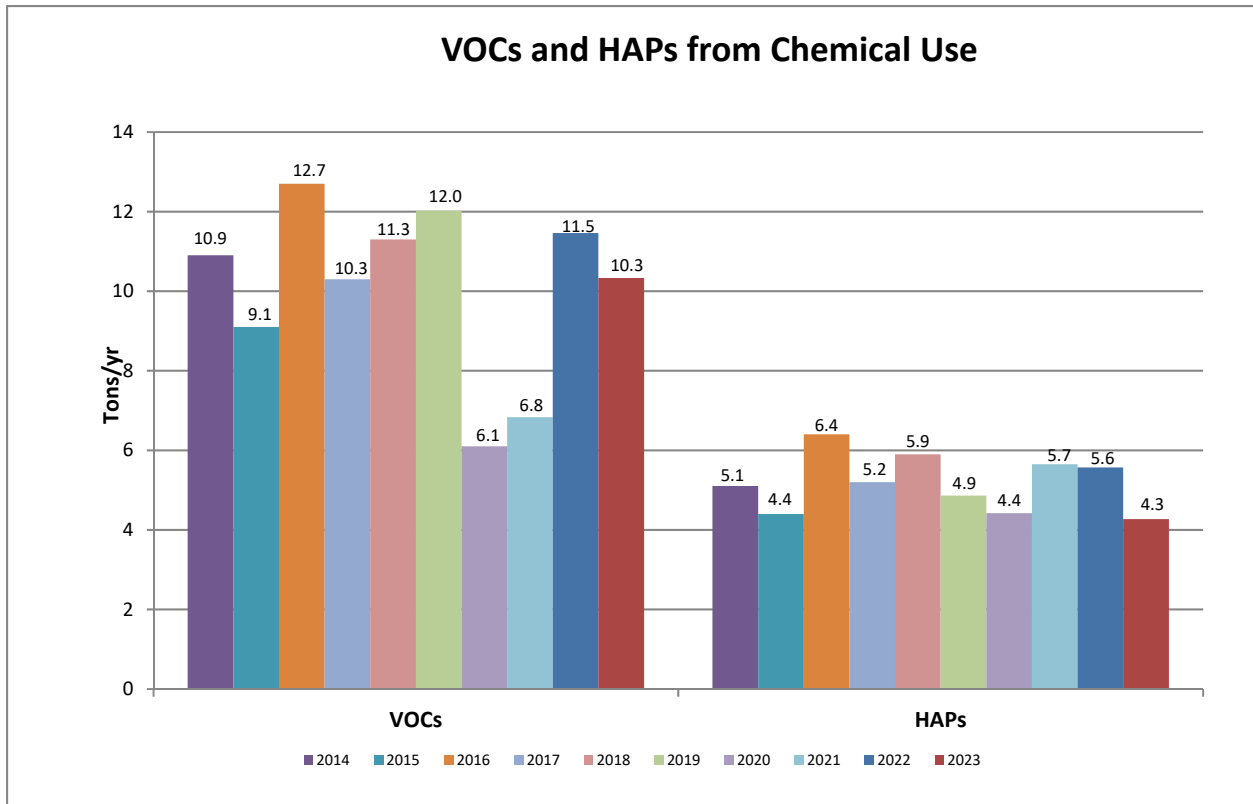


Figure 4.1-3. VOC and HAP emissions from chemical use from 2014 to 2023

REFERENCES

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- NMED (New Mexico Environment Department, Air Quality Bureau), 2001. Letter from Mary Uhl, NMED/AQB to LANL, dated January 30, 2001.
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ATTACHMENT A:

Emission Calculation Worksheets for Individual Emission Units

ATTACHMENT B:
2023 Annual Emissions Inventory Submittal to NMED

ATTACHMENT C:

2023 Semi-Annual Emissions Reports

Submitted Under Title V Operating Permit Requirements