

2. Compliance Summary

Lawrence Livermore National Laboratory (LLNL) activities comply with applicable federal, state, and local environmental regulations, internal requirements, Executive Orders, and U.S. Department of Energy (DOE) Orders as specified in Contract DE-AC52-07NA27344. This chapter provides an overview of LLNL's compliance programs and activities during 2021, as well as a listing of all active environmental permits.

2.1 Environmental Restoration and Waste Management

2.1.1 Comprehensive Environmental Response, Compensation and Liability Act

Ongoing remedial investigations and cleanup activities for legacy contamination of environmental media at LLNL fall under the jurisdiction of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Title I of the Superfund Amendments and Reauthorization Act (SARA). CERCLA is commonly referred to as the Superfund law.

CERCLA compliance activities for the Livermore Site and Site 300 are summarized in **Sections 2.1.1.1** and **2.1.1.2**. Community relations activities conducted by DOE/LLNL are also part of these projects. See **Chapter 7** for more information on the activities and findings of the investigations.

2.1.1.1 Livermore Site Groundwater Project

The Livermore Site came under CERCLA in 1987 when it was placed on the National Priorities List. The Livermore Site Groundwater Project (GWP) complies with provisions specified in a Federal Facility Agreement (FFA) entered into by the U.S. Environmental Protection Agency (EPA), DOE, the California Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). As required by the FFA, the GWP addresses compliance issues by investigating potential contamination source areas (e.g., suspected old release sites, solvent-handling areas, leaking underground tank systems), monitoring water quality through an extensive network of wells, and remediating contaminated soil and groundwater. The primary soil and groundwater contaminants (constituents of concern) are volatile organic compounds (VOCs), primarily trichloroethylene (TCE) and perchloroethylene (PCE). Background information on LLNL Livermore Site environmental characterization and restoration activities is presented in the *CERCLA Remedial Investigation Report for the LLNL Livermore Site* (Thorpe et al., 1990). The *LLNL Groundwater Project 2021 Annual Report* (Noyes et al., 2022) presents the current status of cleanup at the Livermore Site.

Regulatory Deliverables. In calendar year 2021, the following Livermore Site deliverables were submitted to the regulatory agencies:

- *The Livermore Site Fourth Quarter 2020 Self-Monitoring Report*
- *LLNL Groundwater Project 2020 Annual Report*

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- *Addendum to the Fifth Five-Year Review*
- *First, Second, and Third Quarter 2021 Self-Monitoring Reports*
- Work plans for well and borehole drilling at the Livermore Site in Fiscal Year 2021

Treatment Facilities. During 2021, the Livermore GWP maintained 27 groundwater and 8 soil vapor treatment facilities. The groundwater extraction wells and dual extraction wells extracted about 961 million L of groundwater during 2021. The dual extraction wells and soil vapor extraction wells together removed approximately 3.9 million m³ of soil vapor.

In 2021, the Livermore GWP treatment facilities removed about 38 kg of VOCs. Since remediation efforts began in 1989, more than 26.5 billion L of groundwater and approximately 36.5 million m³ of soil vapor have been treated, removing about 3,467 kg of VOCs.

Livermore Site restoration activities in 2021 were focused on enhancing and optimizing ongoing operations at treatment facilities. Evaluation of technologies that may accelerate cleanup of the Livermore Site contaminant source areas, and address areas of co-mingled VOC and low-level tritium plumes, also continued. Beneath the site, groundwater concentration and hydraulic data indicate subtle but consistent declines in VOC concentrations and areal extent of contaminant plumes in 2021. Hydraulic containment along the western and southern boundaries of the site was fully maintained in 2021, and progress was made toward interior plume and source area cleanup. See Noyes et al. (2022) for more information.

Community Relations. Livermore Site community relations activities in 2021 included maintaining information repositories and an administrative record; sending letters to near neighbors living to the west of LLNL providing an update on the progress of the off-site groundwater plume cleanup; and disseminating environment-related news releases and internal/external newsletter articles. In addition, DOE/LLNL environmental documents, letters, and public notices were posted on a revised public website: <https://enviroinfo.llnl.gov/>. DOE/LLNL was unable to conduct CERCLA community tours of the Livermore Site during 2021 due to the COVID-19 pandemic. There were also no Technical Assistance Grant meetings requested by Tri-Valley Communities Against a Radioactive Environment (Tri-Valley CAREs) during 2021.

2.1.1.2 Site 300 Environmental Restoration Project

Remedial activities are ongoing at Site 300, which became a CERCLA site in 1990 when it was placed on the National Priorities List. Remedial activities are overseen by the EPA, the Central Valley Regional Water Quality Control Board (CVRWQCB), and DTSC, under the authority of an FFA for the site. Contaminants of concern at Site 300 include VOCs (primarily TCE), high-explosive compounds, tritium, depleted uranium, silicone-based oils, nitrate, perchlorate, polychlorinated biphenyls, dioxins, furans, and metals. The contaminants present in environmental media vary within the different environmental restoration operable units (OUs) at the site. See Webster-Scholten (1994) and Ferry et al. (1998) for background information on LLNL environmental characterization and restoration activities at Site 300. The *Annual 2021 Compliance Monitoring Report* (Buscheck et al., 2022) presents the current status of cleanup at

Site 300.

Regulatory Deliverables. In calendar year 2021, the following Site 300 deliverables were submitted to the regulatory agencies:

- *Southeast Corner Five-Year Review*
- *Addendum to the Fourth Five-Year Review for the General Services Area Operable Unit*
- *Addendum to the Fourth Five-Year Review for the Building 834 Operable Unit*
- *Addendum to the Second Five-Year Review for Operable Units 3 and 8*
- *Addendum to the Third Five-Year Review for the High Explosives Process Area Operable Unit*
- *Addendum to the Five-Year Review for East/West Firing Areas*
- *Addendum to the Second Five-Year Review for the Building 832 Canyon Operable Unit*
- *Annual 2020 Compliance Monitoring Report*
- *First Semester 2021 Compliance Monitoring Report*
- Work plans for well drilling and decommissioning at Site 300 in Fiscal Year 2021

All calendar year 2021 milestones were met or renegotiated with the regulatory agencies.

Treatment Facilities. During 2021, the Site 300 Environmental Restoration Project (ERP) operated 16 groundwater and 5 soil vapor treatment facilities at Site 300. The groundwater extraction wells and dual extraction wells extracted about 26.3 million L of groundwater during 2021. The dual extraction wells and soil vapor extraction wells together removed 2.2 million m³ of soil vapor.

In 2021, the Site 300 treatment facilities removed approximately 7.7 kg of VOCs, 0.057 kg of perchlorate, 1,156 kg of nitrate, 0.084 kg of the high explosive compound RDX, and 0.003 kg of uranium. Since groundwater remediation began in 1990, approximately 1,812 million L of groundwater and 40 million m³ of soil vapor have been treated, resulting in removal of approximately 642 kg of VOCs, 1.9 kg of perchlorate, 23,000 kg of nitrate, 3.0 kg of RDX, 9.5 kg of silicone oils, and 0.1 kg of uranium.

Site 300 restoration activities in 2021 were focused on enhancing and optimizing ongoing operations at treatment facilities, continuing bioremediation treatability studies, and ongoing monitoring of groundwater remediation progress. Groundwater monitoring data indicate declines in contaminant concentrations in 2021 and progress toward off-site and on-site plume and source area cleanup. See Buscheck et al. (2022) for more information.

Community Relations. Site 300 community relations activities in 2021 included maintaining information repositories and an administrative record. DOE/LLNL environmental documents, letters, and public notices were posted on a public website: <https://enviroinfo.llnl.gov/>. DOE/LLNL was unable to conduct CERCLA community tours of Site 300 during 2021 due to the COVID-19 pandemic. There were also no Technical Assistance Grant meetings requested by Tri-Valley CAREs during 2021.

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2.1.2 Emergency Planning and Community Right-to-Know Act and Toxics Release Inventory Report

Title III of SARA, known as the Emergency Planning and Community Right-to-Know Act (EPCRA), requires owners and operators of facilities who handle certain hazardous chemicals on-site to provide information on the release, storage, and use of these chemicals to organizations responsible for emergency response planning. Executive Order 13834, Efficient Federal Operations, directs all federal agencies to comply with the requirements of the EPCRA, including SARA, Section 313, the Toxic Release Inventory (TRI) Program. EPCRA requirements and LLNL compliance are summarized in **Table 2-1**.

LLNL has reported lead release data via the Form R for Site 300 since 2002. The Form R is used for reporting TRI chemical releases and includes information about waste management and waste minimization activities. Over 99 percent of lead releases are associated with activities at the Site 300 Small Firearms Training Facility (SFTF). Data for the 2020 TRI Form R for lead at Site 300 was submitted to DOE/National Nuclear Security Administration (NNSA) on June 16, 2021.

LLNL reported mercury release data via the Form R for the Livermore Site last year. Data for the 2020 TRI Form R for mercury at the Livermore Site was submitted to DOE/NNSA on June 15, 2021.

Table 2-1. Compliance with EPCRA

EPCRA section	Brief description of requirement	LLNL action
302	Notify SERC of presence of extremely hazardous substances.	Originally submitted 05/87.
303	Designate a facility representative to serve as emergency response coordinator.	Last update submitted 12/29/20 to San Joaquin County for Site 300 and 12/30/20 to the LPPD for Livermore Site.
304	Report releases of certain hazardous substances to SERC and LEPC.	No EPCRA-listed extremely hazardous substances were released above reportable quantities in 2020.
311	Submit SDSs or chemical list to SERC, LEPC, and Fire Department.	Per the California Office of Emergency Services, the EPCRA Section 311 requirement is satisfied by the EPCRA Section 312 submittal and the filing of necessary amendments within 30 days of handling a previously undisclosed hazardous material subject to Section 312 inventory requirements.
312	Submit hazardous chemical inventory to local administering agency (county).	Submitted to San Joaquin County and the LPPD on 01/05/21 and 02/12/21, respectively.
313	Submit Form R to U.S. EPA and California EPA for toxic chemicals released above threshold levels.	Form R for lead for Site 300 submitted to DOE on 06/16/21, DOE forwarded it to U.S. EPA and California EPA on 06/30/21. Form R for mercury for the Livermore Site submitted to DOE on 06/15/21, DOE forwarded it to U.S. EPA and California EPA on 06/30/21.

Note: See the **Acronyms and Glossary** section for acronym definitions.

2.1.3 California Accidental Release Prevention Program

The California Accidental Release Prevention (CalARP) Program is the combined federal and state program for the prevention of accidental release of regulated toxic and flammable substances. The goal of the combined program is to eliminate the need for two separate and

distinct chemical risk management programs. The purpose of the CalARP program is to prevent accidental releases of substances that can cause serious harm to the public and the environment, to minimize the damage if releases do occur, and to satisfy Community Right-to-Know laws. The CalARP program is implemented at the local government level by Certified Unified Program Agencies (CUPAs). The related federal regulations are the Clean Air Act (CAA) Section 112(r) and Title 40, Code of Federal Regulations, Part 68 (40 CFR Part 68).

LLNL submitted a revised Livermore Site CalARP Level 1 risk management plan (RMP) in September 2021. The Livermore Site RMP includes lithium hydride, hydrofluoric acid, and nitric acid.

2.1.4 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) provides the framework at the federal level for regulating solid wastes, including wastes designated as hazardous. The California Hazardous Waste Control Law (HWCL) and California Code of Regulations (CCR) Title 22 set requirements for managing hazardous wastes and implementing RCRA in California. LLNL works with DTSC and CUPA to comply with these regulations and obtain hazardous waste permits.

The hazardous waste management facilities at the Livermore Site consist of permitted units in Area 612 and Building 625 plus Buildings 693, 695, and 696, which make up the Decontamination and Waste Treatment Facility (DWTF). Permitted waste-management units include container storage, tank storage, and various treatment processes (e.g., wastewater filtration, blending, and size reduction). LLNL submitted the permit renewal application to DTSC in April 2009, followed by submittal of the human health risk assessment (HHRA) in December 2010 as part of the permit renewal process. DTSC issued the Hazardous Waste Facility Permit on March 11, 2016. However, DTSC stayed the permit on April 29, 2016, based on an appeal, to address three comments that were accepted on December 1, 2016. These three granted appeal comments led to the submission of a revised permit application in 2019. The permit application was deemed by DTSC to be technically complete in September 2021. The public comment period began on October 29, 2021 and ended on February 4, 2022. A final permit decision is anticipated no sooner than summer of 2022.

The hazardous waste management facilities at Site 300 consist of three operational RCRA-permitted facilities. The Explosives Waste Storage Facility (EWSF) and the Explosives Waste Treatment Facility (EWTF) are permitted to store and treat explosives waste, respectively. The Building 883 container storage area (CSA) is permitted to store routine facility-generated hazardous waste such as spent acids, bases, contaminated oil, and spent solvents. Site 300 has one post-closure permit for the RCRA-closed Building 829 High Explosives Burn Pits. DTSC issued the Hazardous Waste Facility Permit (HWFP) for EWSF, EWTF and the CSA on June 29, 2017. The HWFP is effective for 10 years, from August 7, 2017–August 7, 2027. DTSC issued the Building 829 post-closure permit on April 28, 2017. The post-closure permit is effective for 10 years, from April 27, 2017–April 27, 2027. Transportation of hazardous or mixed waste over public roads occurs by DTSC-registered transporters, including LLNL.

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2.1.5 California Medical Waste Management Act

All LLNL medical waste management operations are conducted in accordance with the California Medical Waste Management Act (MWMA). The program is administered by the California Department of Public Health (CDPH) and is enforced by the Alameda County Department of Environmental Health (ACDEH) at the Livermore Site, and San Joaquin County Environmental Health Department (SJCEHD) at Site 300. LLNL's medical waste permits are renewed on an annual basis and cover medical waste generation and treatment activities for the Biosafety Level (BSL) 2 facilities, and one BSL 3 facility. LLNL revised the BSL 2 and 3 Medical Waste Management Plans to incorporate new requirements pursuant to California Assembly Bill (AB) 333, which became effective in January 2016. The BSL 2 and 3 Medical Waste Management Plans and Emergency Action Plans were most recently submitted to the ACDEH in November 2021.

2.1.6 Radioactive Waste and Mixed Waste Management

LLNL manages radioactive waste and mixed waste in compliance with applicable sections of DOE Order 435.1, DOE Manual 435.1-1, DOE Notice 435.1, and the LLNL-developed Radioactive Waste Management Basis for the Lawrence Livermore National Laboratory (LLNL 2019), which summarizes radioactive waste management controls relating to waste generators and treatment and storage facilities.

2.1.7 Release of Property

LLNL does not release property (e.g., vehicles, equipment, or other materials) to the public with residual radioactivity above the limits specified in DOE Order 458.1. Pursuant to written procedures, items that are potentially contaminated or activated are either surveyed prior to the release to the public, or a process knowledge evaluation is conducted to verify that the material has not been exposed to radioactive material or to energy capable of inducing radioactivity in the material. In some cases, both a radiological survey and a process knowledge evaluation are performed. Excessed items that meet the requirements for unrestricted release are donated to interested state agencies, federal agencies, or universities; redeployed to other on-site users; or released to LLNL's Donation, Utilization and Sales group. In 2021, approximately 5,239 equipment release swipes were processed by LLNL's Radiological Measurements Laboratory; the equipment may have subsequently been used on-site or released to the public. This number is higher than in previous years because the criteria for counting swipes was expanded. Utilizing a graded approach, LLNL only keeps track of high value released items (e.g., those items worth greater than \$100,000). In 2021, no high value items were released.

DOE issued a moratorium in January 2000 prohibiting the release of volume-contaminated metals and subsequently suspended the release of metals for recycling purposes from DOE radiological areas in July 2000. No metals subject to the moratorium or suspension were released from LLNL in 2021. Excess property with residual radioactivity above the limits in DOE Order 458.1 is either transferred to other DOE facilities for reuse or transferred to LLNL's Radioactive and Hazardous Waste Management for disposal as radioactive waste.

2.1.1 Federal Facility Compliance Act

LLNL continues to work with DOE to maintain compliance with the Federal Facilities Compliance Act (FFCA) Site Treatment Plan (STP) for LLNL, which was signed in February 1997. LLNL completed four milestones during 2021. An additional 69.78 m³ of newly generated mixed waste was accepted into the approved storage facilities and added to the STP. LLNL removed approximately 64.77 m³ of mixed waste from LLNL in 2021.

Reports and certification letters were submitted to DOE as required. LLNL continued the use of available commercial treatment and disposal facilities that are permitted to accept LLNL mixed waste. These facilities provide LLNL greater flexibility in pursuing the goals and milestones set forth in the STP.

2.1.2 Toxic Substances Control Act

The Federal Toxic Substances Control Act (TSCA) and implementing regulations found in 40 CFR Parts 700–789 govern the uses of newly developed chemical substances and TSCA-governed waste. In 2021, 16 containers of TSCA-regulated polychlorinated biphenyl (PCB) waste with an aggregate weight of 74,592 kilograms were transported to and disposed at RCRA-permitted, Clean Harbors Treatment, Storage, and Disposal Facilities in Aragonite, Utah and Energy Solutions, Utah.

2.2 Air Quality and Protection

2.2.1 Clean Air Act

All activities at LLNL are evaluated to determine the need for air permits or equipment registrations. Air permits are obtained from the Bay Area Air Quality Management District (BAAQMD) for the Livermore Site and from the San Joaquin Valley Air Pollution Control District (SJVAPCD) and/or BAAQMD for Site 300. The BAAQMD also administers a boiler registration program for natural gas fueled boilers with rated heat input capacities greater than 2 million British Thermal Units per hour (BTU/hr) and less than 10 million BTU/hr.

Both the BAAQMD and the SJVAPCD are overseen by the California Air Resources Board (CARB), which also oversees the statewide permitting for portable diesel fuel-driven equipment such as portable generators and portable air compressors. In addition, CARB presides over the state-wide registration of in-use off-road diesel vehicles (e.g., diesel-powered forklifts, loaders, backhoes, graders, and cranes), on-road heavy-duty diesel vehicles with a gross vehicle weight rating > 14,000 pounds (e.g., garbage trucks, street sweepers, and bucket trucks) and large spark-ignition (LSI) engine vehicles (e.g., gasoline, propane and electric forklifts, scrubbers/sweepers, and industrial tow tractors).

In 2021, LLNL operated 110 permitted air-pollutant emission sources at the Livermore Site and 33 permitted air-pollutant emission sources at Site 300. In addition, LLNL maintained the registrations for 39 natural gas-fired boilers with the BAAQMD at the Livermore Site. LLNL also maintained registrations for 13 portable diesel engines powering various portable equipment, 98 in-use off-road diesel vehicles, 13 on-road heavy-duty diesel vehicles, and 134 LSI engine

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vehicles with CARB at the Livermore Site and Site 300.

In 2021, LLNL continued to maintain a Synthetic Minor Operating Permit (SMOP) with the BAAQMD to ensure that facility-wide actual emissions of regulated air pollutants from the Livermore Site did not exceed federal CAA Title V emission limits. The source categories covered under the SMOP include solvents, fuel dispensing, remediation and wastewater, and combustion. LLNL was initially issued the SMOP by the BAAQMD in 2002 after it was determined that LLNL had the potential to emit regulated air pollutants in excess of federal CAA Title V emission limits if all emission sources at the Livermore Site were to operate at maximum capacity. As a result, LLNL agreed to receive federally enforceable permit conditions in the SMOP that limit actual emissions of regulated air pollutants from sources rather than potential emissions from sources. As such, LLNL has been able to demonstrate through extensive monitoring and record keeping practices of emissions for sources and meeting significantly reduced air pollutant emissions limits in the SMOP, that its actual emissions are well below CAA Title V emission limits, and thus, LLNL is not a “major facility” of air pollutant emissions per 40 CFR Part 70.2.

On July 15, 2016, Site 300 was reclassified by SJVAPCD from a Title V Major Facility to a Minor Facility with potential to emit (PTE) less than 10 tons per year for VOCs. As a Minor Facility, Site 300 is no longer mandated to tally its rolling 12-month emissions, as previously required by SJVAPCD. In addition, Site 300 is no longer subject to annual compliance inspections, but falls under a biennial schedule.

Under the authority of AB 32, the State of California adopted several regulations to reduce greenhouse gas emissions. California’s Mandatory Reporting of Greenhouse Gas Emissions Regulation initially (for calendar years 2008-2011) required certain facilities to annually report greenhouse gas emissions from natural gas combustion when annual emissions exceeded 25,000 metric tons of CO₂ equivalent (CO₂e). The regulation was amended, and the reporting threshold was lowered to 10,000 metric tons per year of CO₂e beginning with calendar year 2012.

Since 2008, the Livermore Site’s annual greenhouse gas emissions from natural gas combustion have been slightly below 25,000 metric tons CO₂e. LLNL began reporting the Livermore Site’s greenhouse gas emissions from natural gas combustion for calendar year 2012 and has reported each year since.

The CARB regulation to reduce greenhouse gas emissions from semiconductor operations applies to semiconductor (or related devices) operations that use fluorinated gases or fluorinated heat transfer fluids (HTFs). The regulation aims to reduce fluorinated compound air emissions which are very potent greenhouse gases. Facilities with semiconductor operations using fluorinated gases or HTFs are required to report fluorinated gas emissions beginning with calendar year 2010 and each calendar year thereafter. In 2021 LLNL’s annual emissions of fluorinated gases from semiconductor operations were below the 800 metric ton (MT) CO₂e threshold. Facilities that exceed the 800 MT CO₂e threshold are required to meet strict emission standards for semiconductor operations.

Also under the authority of AB 32, California has adopted regulations pertaining to sulfur

hexafluoride (SF₆), because of its high global warming potential. LLNL was required to submit an annual report to the CARB describing research uses of SF₆, SF₆ purchases, and the measures taken to control the SF₆ emissions from such research activities. Furthermore, LLNL was required to keep records on the amounts of SF₆ (and other greenhouse gases) contained in and emitted from gas insulated equipment during calendar year 2021 with an annual emission limit of 1% of its annual average CO₂e capacity. During CY 2021 LLNL's annual emission limit was 267.5 MT CO₂e and its actual emission was 2,772.9 MT CO₂e. The high emissions were primarily due to leaks from the U424 substation and from five old sectionalizing switches that were retired. The U424 substation leaks were repaired as part of a ten-year major maintenance effort and no additional leaks were found after the repairs. The U424 substation leaks accounted for 79.5% of CY 2021 emissions and the five retired sectionalizing switches leaks accounted for 17.6% of CY 2021 emissions.

In addition, LLNL continues to implement reductions and controls to minimize CO₂ emissions. LLNL is replacing diesel engines, boilers, and hot water heaters on a continuing basis, and the new equipment is more efficient in terms of fuel use and air emissions, such as CO₂. Site 300 emissions of CO₂ are much lower than Livermore Site emissions, and there is no natural gas service at Site 300 that would generate CO₂ emissions.

The EPA has a Mandatory Reporting of Greenhouse Gases regulation for stationary emission sources, similar to California's regulation. LLNL is currently below the EPA mandatory reporting threshold of 25,000 metric tons per year at both the Livermore Site and Site 300.

2.2.2 National Emission Standards for Hazardous Air Pollutants, Radionuclides

To demonstrate compliance with 40 CFR Part 61, Subpart H (National Emission Standards for Hazardous Air Pollutants [NESHAPs] for radiological emissions from DOE facilities), LLNL monitors certain air-release points and evaluates the maximum potential dose to the public. The *LLNL NESHAPs 2021 Annual Report* (Wilson et al. 2022) reported that the estimated maximum radiological dose from radioactive air emissions were 4.7E-2 μSv (4.7E-3 mrem) for the Livermore Site and 8.3E-7 μSv (8.3E-8 mrem) for Site 300. The totals are well below the 100 μSv/y (10 mrem/y) site-wide dose limits defined by the NESHAPs regulation. The *LLNL NESHAPs 2021 Annual Report* is in Appendix C of this report.

2.3 Water Quality and Protection

LLNL complies with requirements of the Federal Clean Water Act (CWA), the Porter-Cologne Water Quality Control Act, the Safe Drinking Water Act (SDWA), the California Aboveground Petroleum Storage Act (APSA), the California Water Code, the California Health and Safety Code (CH&SC), and the City of Livermore ordinances by complying with regulations and obtaining permits issued by the appropriate regulatory agencies whose mission is to protect water quality.

2.3.1 Storm Water, Wastewater, and Drinking Water

LLNL complies with the requirements of National Pollutant Discharge Elimination System

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(NPDES) and Waste Discharge Requirement (WDR) permits; and Water Quality Certifications issued by Regional Water Quality Control Boards (RWQCBs) and the State Water Resources Control Board (SWRCB) for discharges to waters of the U.S. and waters of the state. Discharges to the City of Livermore's sanitary sewer system are governed by permits issued by the Water Resources Division (WRD). The SDWA requires that LLNL register Class V injection wells with the EPA, and LLNL obtains permits from the Army Corps of Engineers (ACOE) for work in wetlands and waters of the U.S.

2.3.2 SPCC/APSA

The Spill Prevention, Control, and Countermeasures (SPCC) Rule is published under the authority of Section 311 of the CWA for the purposes of preventing discharges of oil into navigable waters of the U.S. or adjoining shorelines. The APSA program regulates non-transportation related facilities in California with aggregate aboveground petroleum storage capacities with the potential to discharge petroleum into waters of the state. Both the CWA and APSA require LLNL to prepare and implement SPCC plans at the Livermore Site and Site 300, which include procedures, methods, and inspections to prevent and mitigate potential discharges of oil for applicable aboveground oil containers and oil-filled equipment systems.

The Livermore Site SPCC Plan had two technical amendments in 2021 (May and December) that were certified by a registered Professional Engineer (P.E.) and included the permanent closure of 11 existing systems and the addition of 21 new systems. The Site 300 SPCC Plan had two technical amendments in 2021 (April and November) that were certified by a P.E. and included the permanent closure of 1 existing system and the addition of 3 new systems. The end of year 2021 total oil storage capacities were 707,406 gallons for 497 equipment systems at the Livermore Site and 53,579 gallons for 86 equipment systems at Site 300. The total aboveground petroleum oil storage capacities, as submitted in the California Environmental Reporting System (CERS), were 550,868 gallons for the Livermore Site and 53,579 gallons for Site 300.

2.3.3 Underground Storage Tanks

LLNL has underground storage tanks (USTs) at the Livermore Site and Site 300 that store petroleum products (diesel, gasoline, and ethanol) for vehicle fuel dispensing and to supply emergency backup generators. USTs that store hazardous substances in California are regulated by the EPA, the SWRCB, and the local CUPAs.

There are 9 UST systems at the Livermore Site and 3 UST systems at Site 300 (see **Table 2-2**). The Livermore-Pleasanton Fire Department (LPFD) and the SJCEHD issue permits for operating these USTs, as required by the CCR and the CH&SC (see **Table 2-3**). The tank owner and tank operator for the permitted UST systems at LLNL is DOE/NNSA and Lawrence Livermore National Security, LLC (LLNS), respectively.

Three of the USTs at the Livermore Site (611TFUD01, 611TFUG01, 611TFUG02) are single-walled systems that are required to be permanently closed by December 31, 2025 in accordance with the CH&SC. Ongoing efforts are being made to evaluate these UST systems for potential modifications, replacements, or closure to meet the upcoming regulatory deadline.

Table 2-2. UST Inventory at LLNL Livermore Site and Site 300, 2021

Equipment ID	Location	Size	Type	Material	Contents
111TFUD01	B-111	350 Gallons	Emergency Generator	DW Steel-FRP Wrap Tank DW Steel-Fiberglass Piping	Diesel
112TFUD01	B-112	350 Gallons	Emergency Generator	DW Steel-FRP Wrap Tank DW Steel-Fiberglass Piping	Diesel
152TFUD01	B-152	1,000 Gallons	Emergency Generator	DW Steel-FRP Wrap Tank DW Steel-Flexible Piping	Diesel
271TFUD01	B-271	1,000 Gallons	Emergency Generator	DW Fiberglass Tank DW Flexible-Fiberglass Piping	Diesel
365TFUD01	B-365	500 Gallons	Emergency Generator	DW Steel-HDPE Tank DW Flexible Piping	Diesel
611TFUD01	B-611	10,000 Gallons	Fueling Station	DW Fiberglass Tank SW Steel Piping	Diesel
611TFUG01	B-611	12,000 Gallons	Fueling Station	DW Fiberglass Tank SW Steel Piping	Unleaded Gasoline
611TFUG02	B-611	12,000 Gallons	Fueling Station	DW Fiberglass Tank SW Steel Piping	Unleaded Gasoline
611TFUE01	B-611	12,000 Gallons	Fueling Station	DW Steel-FRP Wrap Tank DW Fiberglass Piping	Ethanol (E-85)
879TFUD01	B-879	5,000 Gallons	Fueling Station	DW Steel Tank SW Steel Piping	Diesel
879TFUG01	B-879	15,000 Gallons	Fueling Station	DW Steel Tank DW Fiberglass Piping	Unleaded Gasoline
882TFUD01	B-882	1,500 Gallons	Emergency Generator	DW Steel Tank DW Steel Piping	Diesel

Note: See the **Acronyms and Glossary** section for acronym definitions.

2.4 Other Environmental Statutes

2.4.1 National Environmental Policy Act and Floodplains and Wetland Assessments

The National Environmental Policy Act (NEPA) of 1969 is the U.S. government's basic environmental charter. When considering a proposed project or action at LLNL, DOE/NNSA must (1) consider how the action would affect the environment, and (2) make certain that environmental information is available to public officials and citizens before decisions are made and actions are taken. The results of the evaluations and notice requirements are met through publication of "NEPA documents," such as environmental impact statements (EISs) and environmental assessments (EAs) under DOE NEPA Implementing Procedures in 10 CFR Part 1021.

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In 2005, DOE/NNSA completed the Final Site-Wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement (2005 SWEIS) (U.S. DOE/NNSA 2005). In 2011, DOE/NNSA prepared a Supplement Analysis (SA) (DOE/EIS-0348-SA-03) of the 2005 SWEIS to consider whether the 2005 SWEIS should be supplemented, a new EIS should be prepared, or no further NEPA documentation is required (U.S. DOE/NNSA 2011). The SA concluded that a supplement to the 2005 SWEIS or a new SWEIS was not needed. Both the 2011 SA and the 2005 SWEIS are available online at <https://enviroinfo.llnl.gov/nepa>. DOE/NNSA is currently preparing a new SWEIS to analyze the impacts of continued operations at LLNL for the foreseeable future.

In 2020, no EISs or EAs were completed. Several Categorical Exclusions under DOE NEPA Regulations (10 CFR Part 1021) were completed as follows:

- *Corral Hollow Widening Project (NA-2-21)*
- *LLNL Offsite Training Activities (NA-3-21)*

In 2021, a floodplain and wetland assessments were completed for the Corral Hollow Road Widening Project. This project was located within the 100-year floodplain of Corral Hollow Creek and included traffic safety improvements along Corral Hollow Road at the Site 300 entrance and exit area.

As mandated under DOE regulations in 10 CFR Part 1021, floodplain and wetlands assessments were prepared as required information for the upcoming SWEIS.

2.4.2 National Historic Preservation Act

The National Historic Preservation Act (NHPA) provides protection and preservation of historic properties that are significant in the nation's history. LLNL resources subject to NHPA consideration range from prehistoric archeological sites to remnants of LLNL's own history of scientific and technological endeavors. The responsibility to comply with the provisions of the NHPA rests with DOE/NNSA as the lead federal agency in this undertaking. LLNL supports the agency's NHPA responsibilities with direction from DOE/NNSA.

LLNL and DOE/NNSA have completed the necessary inventory, evaluations, and consultations to identify National Register of Historic Places (NRHP) eligible buildings and archaeological sites at the both the Livermore Site and Site 300. In 2005, in consultation with DOE/NNSA, the California State Historic Preservation Officer (SHPO) formally determined that 5 archaeological resources, 5 individual buildings, 2 historic districts (encompassing 13 non-contiguous individual buildings), and selected objects in another building at LLNL are eligible for listing in the NRHP. As of 2020, based on DOE consultations with the SHPO and the Advisory Council on Historic Preservation (ACHP), all previously eligible facilities have been removed from the eligibility list. As final mitigation for loss of integrity for the period of historic significance, LLNL and DOE/NNSA prepared an Historic American Engineering Report (HAER) documentation for these facilities.

2.4.3 Antiquities Act of 1906

The Antiquities Act provides for protection of items of antiquities (i.e., archaeological sites and paleontological remains). The NRHP-eligible archaeological sites noted in Section 2.4.2 are protected under the Antiquities Act. No paleontological remains subject to the provisions of the Antiquities Act were identified in 2020.

2.4.4 Endangered Species Act and Sensitive Natural Resources

LLNL meets the requirements of the Federal and State Endangered Species Acts (ESAs), the Eagle Protection Act, the Migratory Bird Treaty Act, and other applicable regulations as they pertain to endangered species, threatened species, and other special-status species (including their habitats) and designated critical habitats that exist at the LLNL sites.

On August 29, 2018, the U.S. Fish and Wildlife Service issued a sitewide biological opinion to DOE/NNSA for continued operations and maintenance of the LLNL Experimental Test Site, Site 300. Six projects were completed under this biological opinion in 2021: the Small Firearms Training Facility (Building 899) construction, the Building 812 Monitoring Well and Access Route Project, the Pit 7 Road Project, the Building 804 Road Project, the Building 855 Entrance Project, and the Corral Hollow Road Widening Project.

At the Livermore Site, the Building 453 Exascale Computing Facility Modernization (ECFM), Building 031 Emergency Operations Center (EOC), B2200 Electrical Duct Bank Installation, Building 224 Office Building, Building 225 New AME Joining Capabilities & Vapor Deposition Facility, B310 New Nondestructive Evaluation Building, B321G Manufacturing Building, 3200 Block Utility Improvement, Building 642 Office Building, Building 654 LCW Installation, and East Fence Line Revitalization projects were conducted under the 2013 biological opinion for infill construction and redevelopment. Annual flood control maintenance within the Livermore Site reach of Arroyo Las Positas was completed under the 1997 biological opinion, and subsequent amendments, for the arroyo maintenance project on Arroyo Las Positas.

All Terms and Conditions and Conservation Measures required by the biological opinions described above were successfully implemented in 2021.

2.5 Environmental Permits, Inspections, and Occurrences

LLNL's various missions require a variety of permits. **Table 2-3** is a summary of active permits in 2021 at the Livermore Site and Site 300. The external agencies that issue the permits may also perform inspections required by the permits. **Table 2-4** lists environmental inspections and findings from both LLNL sites in 2021.

Notification of environmental occurrences is required under a number of environmental laws and regulations as well as DOE Order 232.2A (Occurrence Reporting and Processing of Operations Information). **Table 2-5** provides a list of environmental occurrences reportable under DOE Order 232.2A.

2. Compliance

Table 2-3. Active Permits in 2021 at the Livermore Site and Site 300

Type of Permit	
Livermore Site	Site 300
Hazardous Waste	
<p>EPA ID No. CA2890012584. Hazardous Waste Facility Permit Number 99-NC-006 and RCRA Part A/B permit application—to operate hazardous waste management facilities. Agency–DTSC.</p> <p>Registered Hazardous Waste Hauler authorized to transport regulated wastes on public roadway. Permit number 1351. Agency– DTSC.</p> <p>Facility I.D. # 10697. Hazardous Waste Generator Program, On-site treatment of hazardous waste (tiered permitting) program: Conditionally Exempt Specified Wastestream, CE231-1, Hazardous Materials Business Program, Above Ground Petroleum Tank Program, and CA Accidental Release Program. Agency – LPFD CUPA.</p>	<p>EPA ID No. CA2890090002. Hazardous Waste Facility Permit and RCRA Part A/B permit application to operate CSA (Building 883), EWTF and EWSF. Agency–DTSC.</p> <p>EPA ID No. CA2890090002. Hazardous Waste Facility Post-Closure Permit and RCRA Site 300 Building 829 Post-Closure Operation Plan. Agency–DTSC.</p> <p>Facility I.D. # FA0003934 RCRA Hazardous Waste Generator category: waste generation in an amount equal to or more than 50 tons, but less than 250 tons. Agency– SJCEHD CUPA.</p>
Medical Waste	
<p>ACDEH issued a Large Quantity Medical Waste Generator permit (PT0200461/PT0305526) that covers medical waste generation and treatment activities for BSL 2 facilities at B132 North and South, B150 Complex, B360 Complex, B663, and the BSL 3 facility.</p>	<p>Registered with SJCEHD as a Small Quantity Medical Waste Generator.</p>
Air	
<p>BAAQMD renewed the Permit-to-Operate (PTO) issued to LLNL Livermore Site (Plant No. 255) which covers 167 existing various air emission sources (110 permitted sources, 39 registered sources, and 18 exempt sources).</p> <p>BAAQMD conducted compliance inspections on 79 air emission sources and two asbestos compliance inspections.</p> <p>BAAQMD issued a revision to the SMOP in 2015, which was initially issued in 2002 to ensure the NOx and HAPs emissions from the site do not exceed federal Clean Air Act Title V emission limits.</p> <p>BAAQMD issued one Asbestos Renovation Permit and three Asbestos Demolition Permits.</p>	<p>SJVAPCD renewed the PTO issued to LLNL Site 300 (Facility ID N-472) which covers 33 existing various air emission sources.</p> <p>BAAQMD renewed the PTO issued to LLNL Site 300 (Plant No. 15611) which covers one existing standby diesel engine powering an emergency generator.</p> <p>SJVAPCD approved a Prescribed Burn Plan for the burning of 2,104.4 acres of grassland at LLNL Site 300.</p> <p>SJVAPCD conducted one compliance inspection on 22 air emission sources.</p> <p>SJVAPCD issued one Asbestos Renovation Permit and one Asbestos Demolition Permit.</p> <p>BAAQMD approved a Prescribed Burn Plan for the burning of 139.1 acres of grassland at LLNL Site 300.</p> <p>CARB renewed two PERP registrations and issued three new PERP registrations for portable diesel engines powering various portable equipment.</p>
Underground Storage Tanks	
<p>UST permit (1016-09202018) issued by LPFD from September 20, 2018–September 19, 2023 covering the operation of 9 USTs and the approved monitoring program and emergency response plan for these systems.</p>	<p>One operating permit covering 3 underground petroleum storage tanks assigned individual permit numbers (PT0006785 [879TFUD01], PT0006530 [882TFUD01], and PT0007967 [879TFUG01]).</p>

Table 2-3. (cont.) Active Permits in 2021 at the Livermore Site and Site 300

Type of Permit	
Livermore Site	Site 300
Sanitary Sewer	
<p>Discharge Permit 1250^(b) for discharges of wastewater to the sanitary sewer.</p> <p>Permit 1510G for discharges to the sanitary sewer of groundwater from CERCLA restoration activities.</p>	<p>WDR R5-2008-0148 for operation of sewage evaporation and percolation ponds, septic systems, cooling tower discharges, mechanical equipment wastewater discharges, and other low-threat discharges.</p>
Water	
<p>WDR No. 88-075 for discharges of treated groundwater from Treatment Facility A to recharge basin.^(c)</p> <p>NPDES General Permit 2014-0057-DWQ (Waste Discharge Identification Number [WDID] 2 011025682) for discharge of storm water associated with industrial activities.</p> <p>NPDES General Permit 2009-0009-DWQ for discharges of storm water associated with construction activities affecting 0.4 hectares (1 acre) or more.</p> <p>FFA for groundwater investigation/remediation.</p> <p>Domestic Water Supply Permit 02-04-20P-0110701</p>	<p>WDR No. 93-100 for post-closure monitoring requirements for two Class I landfills.^(d)</p> <p>WDR R5-2008-0148 for operation of sewage evaporation and percolation ponds, septic systems, cooling tower discharges, mechanical equipment wastewater discharges, and other low-threat discharges.</p> <p>NPDES General Permit 2014-0057-DWQ (WDID 5S39I021179) for discharge of storm water associated with industrial activities.</p> <p>NPDES General Permit 2009-0009-DWQ for discharges of storm water associated with construction activities affecting 0.4 hectares (1 acre) or more.</p> <p>WDR R5-2016-0076 and NPDES No. CAG995002 for limited threat discharges to surface water from the Site 300 drinking water system.</p> <p>Water Code Section 13267 Order, Submittal of Technical and Monitoring Reports For The Active Building 851 Firing Table, Lawrence Livermore National Laboratory Site 300, San Joaquin County</p> <p>Site 300 Domestic Water Supply Permit Amendment No. 01-10-16PA-003 and the Site 300 Granulated Activated Carbon Treatment Facility – Approval to Operate, October 15, 2019.</p> <p>FFA for groundwater investigation/remediation.</p> <p>Approximately 32 registered Class V injection wells.</p>

Note: See the **Acronyms and Glossary** section for acronym definitions.

^(a) Numbers of permits are based on actual permitted units or activities maintained and/or renewed by LLNL during 2021.

^(b) Permit 1250 includes some wastewater generated at Site 300 and discharged at the Livermore Site.

^(c) Recharge basin referenced in WDR Order No. 88-075 is located south of East Avenue within Sandia National Laboratories/California boundaries. The discharge no longer occurs; however, the agency has not rescinded the permit.

^(d) On July 22, 2020, the transfer of Site 300 Closed Landfill Pit 1 from Resource Conservation and Recovery Act (RCRA) Post-Closure Monitoring to Comprehensive Environmental Compensation and Liability Act (CERCLA) was completed. WDR No. 93-100 was rescinded and Pit 1 post-closure compliance monitoring will be conducted under CERCLA oversight.

2. Compliance

Table 2-4. Inspections of Livermore Site and Site 300 by External Agencies in 2021

Medium			
Description	Agency	Date	Finding
Air			
Air pollutant emission sources (Livermore Site)	BAAQMD	01/13/21	No violations
		3/25/21	No violations
		5/27/21	No violations
		8/18/21	No violations
		9/14/21	No violations
Asbestos – Renovation/Demolition (Livermore Site)	BAAQMD	06/03/21	No violations
		12/16/21	No violations
Air pollutant emission sources (Site 300)	SJVAPCD	01/06/21	No violations No violations
Hazardous Materials Business Plan			
CUPA Inspection (Livermore Site)	LPFD	N/A	No violations
CUPA Inspection (Site 300)	SJCEHD	N/A	No violations
Sanitary sewer			
Annual Inspection of the Sewer Monitoring Complex (Livermore Site)	WRD	10/04/21	No violations
Categorical sampling and inspection, Building 153 (Livermore Site)	WRD	03/23/21	No violations
		10/05/21	No violations
Categorical sampling and inspection, Building 161 (Livermore Site)	WRD	10/05/21	No violations
Annual compliance sampling at the Sewer Monitoring Complex (Livermore Site)	WRD	10/05/21	No violations
Café grease interceptor inspections, Buildings 125 and 471 (Livermore Site)	WRD	10/04/21	Visual inspection was conducted for each of the three interceptor chambers at the West Café (B-125), the WRD did not measure FOG (Fats, Oils, and Grease) in the interceptors due to COVID-19 limited operating conditions. No inspection was performed at the Central Café (B-471), which remained closed since March 2020 due to COVID-19.

Table 2-4. (cont.) Inspections of Livermore Site and Site 300 by External Agencies in 2021

Medium			
Description	Agency	Date	Finding
SPCC/APSA, UST and Aboveground Tank Closures			
Annual CUPA Inspection – APSA/SPCC Program (Livermore Site)	LPFD	08/24/21	No violations (SPCC Plan review only)
		08/25–08/26/21	No violations
		08/30–08/31/21	No violations
Annual Spill Bucket/Monitoring Equipment Inspection (Site 300)	SJCEHD	7/29/21	SJCEHD issued one violation for failing to conduct secondary containment testing within the required time frame. The test was performed on time, but due to a loss of suction on the boot of the containment pipe, the entire test could not be completed. The boot was repaired, and the test was completed in December of 2020. The violation was not received until the following inspection in July of 2021.
Triennial CUPA Inspection – APSA/SPCC Program (Site 300)	SJCEHD	12/07/21	SJCEHD issued one violation due to a failure to include all APSA regulated equipment in the SPCC Plan. This action was resolved by adding the missing piece of equipment to the SPCC Plan within 30 days of receiving the violation.
Triennial Overfill Prevention Equipment System Inspection for B879 Fuel Station USTs and B882 Emergency Generator (Site 300)	SJCEHD	09/28/21	No violations
Annual Spill Container Test/ Annual Monitoring System Certification for emergency generator USTs (Livermore Site)	LPFD	07/27–07/28/21	No violations
Annual Spill Container Test/ Annual Monitoring System Certification for B611 Fuel Station USTs (Livermore Site)	LPFD	08/10–08/11/21	No violations
Triennial Overfill Prevention Equipment System Inspection for B611 Fuel Station USTs (Livermore Site)	LPFD	09/29/21	No violations
		11/02/21	No violations
B611 Ethanol UST Dispenser Replacement Project Inspection (Livermore Site)	LPFD	09/29/21 11/02/21	LPFD issued a required corrective action to repair/replace broken brine cap within 30 days. This action was resolved, and no violations were issued.
Aboveground Tank Closures (Livermore Site):	LPFD		
622-D1A2, 241-D1A1		07/14/21	No violations
251-D1A1, 435-D1A1			
343TFAD01, 292-D1B1		09/07/21	No violations
243 Hydraulic Oil Tank			
175-GDE-01		09/13/21	No violations

2. Compliance

Table 2-4. (cont.) Inspections of Livermore Site and Site 300 by External Agencies in 2021

Medium			
Description	Agency	Date	Finding
Waste			
CUPA Inspection (Livermore Site)	LPFD	08/25–08/26/21 08/30–08/31/21	No violations
CUPA Inspection (Site 300)	SJCEHD	12/06–12/07/21	No violations
Hazardous waste facilities Compliance Evaluation Inspection (CEI) (Livermore Site)	DTSC	09/21–09/23/21	Two minor violations: one permit condition for failure to inspect/clean up powder product observed on ground, one maintenance and operation of facility related regarding dried spill.
Hazardous waste facilities Compliance Evaluation Inspection (CEI) (Site 300)	DTSC	NA	No inspection in 2021
Medical Waste facilities inspection	ACDEH	12/15/21	No violations
Water			
Permitted operations (Site 300 Drinking Water)	SWRCB	N/A	No inspection during 2021
Waste Discharge Requirements for sewage pond, percolation pits, septic systems, cooling tower discharges, mechanical equipment wastewater discharges, and other low-threat discharges	CVRWQCB	04/28/21 (virtual)	No violations
		10/18/21 (virtual)	No violations

Note: See the **Acronyms and Glossary** section for acronym definitions

Table 2-5. Environmental Occurrences Reported under the Occurrence Reporting System in 2021

Date ^(a)	Occurrence category/group	Description
08/02/21	Report Level I Occurrence under Group 9(1) OR 2021-0024	On July 29, 2021, the SJCEHD performed an inspection of USTs at Site 300, which identified a violation for: Failure to conduct secondary containment testing per CCR 2637 (a-d), 2712(b)(1)(F). A Request to Rescind is in progress for the violation.
11/10/21	Report Level I Occurrence under Group 9(1) OR 2021-0031	On November 10, 2021, LLNL received a Summary of Violation following a CEI inspection at the Livermore Site conducted September 21-23, 2021. The inspection report identified two minor violations: <ol style="list-style-type: none"> <li data-bbox="732 499 1422 550">1. Assessors observed two ounces of dried liquid on the epoxy coated secondary containment floor under the B695 cold-vapor evaporator. <li data-bbox="732 562 1451 667">2. LLNL did not take on-the-spot corrective action and verify that building areas, containers, tanks, and treatment equipment are in good condition and free of leaks and spills. LLNL did not correct small spills in two instances.
01/04/22	Report Level I Occurrence under Group 9(1) OR 2022-0003	LLNL received one minor violation from the SJCEHD in response to the Site 300 triennial APSA inspection conducted on December 6, 2021 and December 7, 2021. The violation was received due to an administrative error in the SPCC Plan. A tank outside of B801 was not fully incorporated into Appendix C, page C-11 of the Plan, due to an error in the function used to create the inventory list published in the Plan. However, the tank was included in the SPCC Plan map, the monthly inspections were being performed on the tank, and an intake inspection was initially performed.

Note: See the **Acronyms and Glossary** section for acronym definitions.

^(a) Date the occurrence was categorized, not discovered.

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