3. Environmental Program Information

Heather Ottaway, Alison Terrill, Jim Woollett

Lawrence Livermore National Laboratory (LLNL) is committed to enhancing its environmental stewardship and to reducing any impacts its operations may have on the environment. This chapter describes LLNL's Environmental Management System (EMS) and Pollution Prevention/Sustainability Program (P2S).

3.1 Environmental Management System

LLNL continues to enhance its EMS through systematic process improvements and increased focus on establishing specific environmental objectives and performance measures contained in Environmental Management Plans (EMPs). Progress toward goals is regularly measured and provided to senior management and other interested parties through a variety of means including periodic senior management reports and the yearly update of this Environmental Report. The Laboratory's EMS has successfully maintained its International Organization for Standardization (ISO) 14001 registration since 2009 and is audited annually by a third-party internationally recognized ISO registrar for continued conformance and certification.

3.1.1 Environmental Management Plans

EMPs are designed and implemented to address the Laboratory's most significant environmental effects (aspects) and to achieve environmental objectives and performance measures that substantively reduce such effects. EMPs are updated annually to incorporate new initiatives and effectively demonstrate LLNL's commitment to continuous improvement. **Table 3-1** lists the eight EMPs for FY2015, along with the significant environmental aspects each addresses, the Lab-wide environmental objectives, and the related DOE sustainability goals. LLNL's status toward meeting each of the DOE sustainability goals listed in **Table 3-1**, along with planned actions to ensure continued progress toward attaining these goals can be found in the *LLNL FY15 Site Sustainability Plan* in **Appendix D**.

Table 3-1. Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Environmental Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goal(s)
Sustainable Acquisition	• Nonhazardous Materials Use • Municipal Waste Generation	Promote lab-wide Site Sustainability Goal 6.1 and to support DOE in meeting its Executive Order (EO 13514) requirements by including necessary provisions and clauses to affect new purchases, such as ensuring a procurement preference for EPEAT-registered electronic products.	6.1: Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year).
Municipal Waste Reduction	• Municipal Waste Generation	Divert at least 50% of non-hazardous solid waste (including construction and demolition debris) by FY2015 to meet Site Sustainability Goals 5.1 and 5.2 and increase recycling.	5.1: Divert at least 50% of nonhazardous solid waste, excluding construction and demolition debris by FY15. 5.2: Divert at least 50% of construction and demolition materials and debris by FY15.
Greenhouse Gas Reduction	• Greenhouse Gas Emissions	Reduce Scope 1 & 2 GHG by 28% from the FY08 baseline by FY20 (Site Sustainability Goal 1.1). Reduce Scope 3 GHG by 13% from the FY08 baseline by (Site Sustainability Goal 1.2).	1.2: 13% Scope 3 GHG reduction by FY20 from a FY08 baseline. 3.2: 2% annual reduction in fleet petroleum consumption by FY20 relative to a FY05 baseline. 7.3: Power management – 100% of eligible PCs, laptops, and monitors have power management enabled.

Table 3-1. (cont.) Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Environmental Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goal(s)
Hazardous Materials Use and Hazardous Waste Generation	• Hazardous Materials Use Hazardous Waste Generation	Reduce the use and inventory of hazardous materials. Chemical reduction efforts should be closely coordinated with ChemTrack inventory efforts to provide greater efficiency. Minimize the generation of routine hazardous, mixed low-level, and/or low-level waste.	n/a
Ecological Resources Disturbances	• Ecological Resources Disturbances	Protect native species, sensitive wetland areas, and prohibit the release of invasive species in support of DOE/NNSA's compliance and long-term natural resource stewardship responsibilities.	n/a
Energy Conservation	• Electrical Energy Use • Greenhouse Gas Emissions • Fossil Fuel Consumption	Reduce energy intensity (BTU per gross square foot) as described in the Site Sustainability Plan in support of the Executive Order goal of reducing Federal Agency use by 30% by FY15 from the FY03 baseline (Site Sustainability Plan Goal 2.1).	2.5: 15% of existing buildings greater than 5,000 gross square feet (GSF) are compliant with the Guiding Principles (GPs) of HPSB by FY15. 2.6: All new construction, major renovations, and alterations of buildings greater than 5,000 GSF must comply with the GPs. 7.2: Maximum annual weighted average Power Utilization Effectiveness (PUE) of 1.4 by FY15. 7.3: Power management –100% of eligible PCs, laptops, and monitors have power management enabled.

Table 3-1. (cont.) Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Environmental Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goal(s)
Water Conservation	• Water Use	Reduce potable water intensity (Gal per gross square foot) as described in the Site Sustainability Plan in support of the Executive Order goal of reducing Federal Agency use by 26% by FY20 from the FY07 baseline (Site Sustainability Goal 4.1).	4.1: 26% potable water intensity (gallons per gross square foot) reduction by FY20 from a FY07 baseline. 4.2: 20% water consumption (gal) reduction of industrial, landscaping, and agricultural (ILA) water by FY20 from a FY10 baseline.
Fossil Fuel Consumption	• Fossil Fuel Consumption	Reduce fleet petroleum consumption by 2% annually by FY20 relative to the FY05 baseline to meet Site Sustainability Goal 3.2.	3.1: 10% annual increase in fleet alternative fuel consumption by FY15 relative to a FY05 baseline. 3.2: 2% annual reduction in fleet petroleum consumption by FY20 relative to a FY05 baseline. 3.3: 100% of light duty vehicle purchases must consist of alternative fuel vehicles (AFV) by FY15 and thereafter (75% FY2000–2015).

3.1.2 EMS Audits and Reviews

The Laboratory successfully completed one external third-party independent audit of its ISO 14001 EMS program (May 2015) with recommendations from the auditor to re-certify LLNL's ISO 14001 registration. This independent audit was conducted by NSF International Strategic Registrations and validated the Laboratory's solid commitment to environmental stewardship.

3.1.2.2 Internal Assessments and Reviews

In October 2015, Senior Management Reviews of the EMS were conducted, reaffirming management commitment to the Lab's environmental policy and stewardship through the implementation of EMS. In March of 2015, an internal audit (Joint Functional Area Line Management Assessment [JFLMA]) was performed to assess if LLNL continues to meet the requirements of the standard. This audit uses a management assessment model to ensure objectivity and impartiality is maintained during the process.

In accordance with LLNL's EMS, the Laboratory's environmental compliance is regularly evaluated through reviews of internal assessments including Management Self Assessments (MSAs); Management Observations and Inspections (MOIs); regulatory inspections; internal and external monitoring and compliance reports; and facility walk-throughs and work-control assessments. As a result of these reviews, LLNL identifies specific practices and recommendations for corrective and preventive measures, demonstrating the Laboratory's commitment to environmental compliance.

3.2 Pollution Prevention/Sustainability Program

LLNL's P2S Program operates within the framework of the Integrated Safety Management System (ISMS) and EMS and in accordance with applicable laws, regulations, and DOE orders as required by contract. It encompasses stewardship and maintenance, waste stream analysis, reporting of waste generation and P2S accomplishments, and fostering of P2S awareness through presentations, articles, and events. The P2S Program supports institutional and directorate P2S activities via environmental teams and includes implementation and facilitation of source reduction and/or reclamation, recycling, and reuse programs for hazardous and nonhazardous waste; facilitation of sustainable acquisition; and preparation of P2S opportunity assessments.

The P2S Program at LLNL strives to systematically reduce all types of waste generated and eliminate or minimize pollutant releases to all environmental media from all aspects of the operations at the Livermore Site and Site 300. These efforts help protect public health and the environment by reducing or eliminating waste, improving resource usage, and reducing inventories and releases of hazardous chemicals. These efforts also benefit LLNL by reducing compliance costs and minimizing the potential for civil and criminal liabilities under environmental laws. In accordance with EPA guidelines and DOE policy, the P2S Program uses a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and, lastly, treatment and disposal), which is applied to all types of waste. Waste generation is tracked using Radioactive and Hazardous Waste Management's

(RHWM) HazTrack database. By reviewing the information in this database, program managers and P2S Program staff can monitor and analyze waste streams to determine cost-effective improvements to LLNL operations. The P2S Program efforts primarily focus on opportunities to reduce routine waste from ongoing operations and non-routine waste from construction and demolition activities. Data on non-routine hazardous, transuranic, and radioactive waste can be found in the 2015 Annual Yearbook for the LLNL SW/SPEIS (Quinly 2016).

3.2.1 Routine Hazardous, Transuranic, and Radioactive Waste

Routine waste listed in **Tables 3-2 and 3-3** includes waste from ongoing operations produced by any type of production, analysis, and research and development taking place at LLNL. The increase in routine hazardous waste in 2012 was due to an evaporator unit that was out of commission for part of the year and roofing debris from various projects. Similarly, the increase in routine hazardous waste in 2014 was due to construction debris, equipment disposal, and facility maintenance activities. The increase in routine Low-Level Waste (LLW) volumes beginning in 2012 is due to NIF, Physical and Life Sciences Directorate (PLS) and Weapons and Complex Integration (WCI) activities (largely wipe cleaning wastes and personal protective equipment (PPE) disposal), which are expected to remain at this level into the future.

Table 3-2. Routine hazardous waste at LLNL, FY2011–2015.

Waste category	FY2011	FY2012	FY2013	FY2014	FY2015
Routine hazardous waste generated Metric Tons (MT)	143	232	131	202	170

Table 3-3. Routine transuranic and radioactive waste at LLNL, FY2011–2015.

Waste category	FY2011	FY2012	FY2013	FY2014	FY2015
Routine LLW generated (m^3)	678	862	741	896	860
Routine mixed waste generated (m^3)	27.4	46	32	31	19
Routine TRU/mixed TRU waste generated (m^3)	0.4	4.8	7.5	9.5	0.9

3.2.2 Diverted Waste

LLNL maintains an active waste-diversion program, encouraging recycling and reuse of both routine and non-routine waste which prevents waste from going to the landfill. In 2010, DOE changed the annual reporting requirements for waste diversion in response to Executive Order 13514, issued October 5, 2009. This change required separate accounting for construction/demolition and municipal solid wastes and is reflected in **Tables 3-4** and **3-5**.

3.2.2.1 Municipal Solid Waste

Together, the Livermore Site and Site 300 generated 2,557 MT of routine nonhazardous solid waste in FY2015. This volume includes diverted waste (e.g., material diverted through recycling and reuse programs) and landfill waste.

Both sites combined diverted a total 1,934 MT of routine nonhazardous waste in FY2015, which represents a diversion rate of 76%. The portion of routine nonhazardous waste sent to landfill was 623 MT. See **Table 3-4**. In 2015, LLNL recycled 3,841 computers, monitors, and laptops, which were resold or managed as universal waste. LLNL recycled 51 MT of large and small batteries, which were also managed as universal waste and recycled.

LLNL continued to expand recycling opportunities for plastics beyond the comingled recycling program. In 2015, 14.6 MT of plastics were recycled despite a declining plastics recycling market. The comingled recycling and composting program initiated in May 2011 was continued during 2015, diverting 43 MT of comingled recycling and 66 MT of compostable material from the landfill. Waste collection areas in both LLNL on-site Cafeterias were revitalized in FY2015 with new graphics, signs, and bins to encourage better separation of recyclable, compostable, and trash items into the correct bins. To make separation easier for employees and decrease the amount of waste sent to landfill, the Cafeterias switched all disposable foodservice ware to compostable products.

A housekeeping initiative started in FY2013 was completed in early FY2015 and resulted in the clean out and abatement of 44 transport containers that were sent to the Laboratory's Donation, Utilization, and Sales (DUS) group for resale. Transport containers are used to provide supplementary storage outside of LLNL facilities and are typically used steel cargo shipping containers. LLNL was able to resell all 44 containers for reuse avoiding use of landfill space, hazardous waste disposal fees, and recycling transport and energy costs.

In FY2015, LLNL downsized its library facility by replacing hard copy journals and microfilm with electronic journal subscriptions. All retired journals and microfilms were recycled, diverting over 200,000 pounds from landfill.

3.2.2.2 Construction and Demolition (C&D) Waste

C&D wastes include excavated soils, wastes and metals from construction, decontamination and demolition activities. The Livermore Site and Site 300 generated a total of 953 MT of waste related to construction and demolition activities in FY2015. The two sites combined diverted 593 MT of non-routine nonhazardous solid waste through reuse or recycling, which represents a diversion rate of 62% in FY2015. Diverted C&D waste includes soil and concrete reused either on site for other projects or as cover at Class II landfills. See **Table 3-5**.

Table 3-4. Routine municipal waste in FY2015, Livermore Site and Site 300 combined.

Destination	Waste description	Amount in FY2015 (MT)
Diverted	Baled paper	73
	Corrugated cardboard	69
	Cooking grease (including grease traps)	25
	Mixed metals	521
	Scrap lead (Pb)	3
	Plastic	15
	Office paper	165
	Scrap tires	0
	Toner cartridges	11
	Greenwaste (chips, compost, mulch)	511
	Wood	432
	Comingled recycling	43
	Compost (food scraps, paper towels, food containers)	66
	TOTAL diverted	**1,934**
Landfill	Compacted (landfill)	623
	TOTAL landfill	**623**
	TOTAL routine nonhazardous waste	**2,557**

Table 3-5. Construction and Demolition waste in FY2015, Livermore Site and Site 300 combined.

Destination	Waste description	Amount in FY2015 (MT)
Diverted	Class II cover soil (reused at landfill)	98
	Class II concrete (reused at landfill)	490
	Scrap metals (recycled)	5
	TOTAL diverted	**593**
Landfill	Construction and demolition (non-compacted landfill)	360
	TOTAL landfill	**360**
	TOTAL non-routine non-hazardous waste	**953**

3.2.3 Sustainable Acquisition

LLNL has a comprehensive Sustainable Acquisition program that includes preferential purchasing of recycled content and bio-based products. In 2015, the Sustainable Acquisition program continued to include a preference for Electronic Product Environmental Assessment Tool (EPEAT) registered computers and monitors, imaging equipment, and televisions. Ninety-five percent of all desktop electronics, imaging equipment, and television purchases in FY2015 were EPEAT Bronze, EPEAT Silver or EPEAT Gold, indicating that the products meet or exceed the Institute of Electrical and Electronics Engineers (IEEE) 1680-2009; 2012 environmental performance standard for electronic products.

Additional sustainable acquisition highlights can be found in the *LLNL FY15 Site Sustainability Plan* in **Appendix D**.

3.2.4 Pollution Prevention/Sustainability Activities

*3.2.4.1 Environmental Stewardship Accomplishments and Awar*ds

Each year, the P2S Program submits nominations for the NNSA environmental awards and DOE Sustainability awards programs, which recognize exemplary performance in integrating environmental stewardship practices to reduce risk, protect natural resources, and enhance site operations. P2S also submits nominations for various other awards recognizing excellence in P2S projects.

LLNL submitted two award nominations to NNSA and DOE for work performed in FY2015, and was awarded an NNSA Environmental Stewardship Award in the Sustainable Communications category.

LLNL received the 2015 NNSA Environmental Stewardship Award for its sustainable communications efforts. Multiple avenues are used to deliver sustainability messages to employees and to allow employees to provide input back to the program. P2S has made it a program focus to consistently revise, refresh, revamp, and repeat important sustainability concepts and believes this approach is working. The program has also made it a priority to communicate sustainability successes to employees and ask for feedback on programs that may be struggling. Over the past few years, P2S has observed a transition in the conversation with employees concerning sustainability and pollution prevention issues and goals. Employees are reaching out more often and not just with questions and concerns, but with valuable ideas, research and data, calculations, suggestions, and solutions for a more sustainable campus. As this shift toward greater sustainability awareness has occurred, P2S's solid communication foundation and ability to successfully respond with the mechanisms already in place has led to significant sustainability accomplishments. Because of employee input LLNL has a growing personal electric vehicle charging program, greatly improved compost and recycling, and a path forward to refocus efforts on reuse. Employees have voiced their passion for sustainability through various feedback mechanisms and the P2S program has stepped up to take advantage of this paradigm shift.

3.2.4.2 High-Performance Sustainable Buildings and Energy Conservation

The Operations & Business (O&B) Principal Directorate manages the implementation of DOE Order 436.1 objectives related to sustainable building materials and practices.

Due to the unavailability of funding for the continuation of the High Performance Sustainable Building (HPSB) Assessments in FY2015, no new buildings were studied and assessed using the HPSB Assessment tool. While a list of potential buildings to be studied has been compiled, funding for these building assessments has not yet been identified for FY2015 and is not probable for FY2016.

One of LLNL's sustainability goals is to meter all individual buildings for electricity, natural gas, and water, where cost-effective and appropriate. LLNL has developed a metering plan that outlines the approach to repair meters and upgrade existing legacy metering. In FY2015, audits to collect vital information necessary to plan and schedule meter replacements and upgrades were conducted.

LLNL has implemented many on-going sustainability efforts to increase the energy efficiency of data center facilities including the installation of Cold Aisle Containment systems, increasing ambient temperatures and reducing occupancy lighting in several key data center facilities, server consolidation, and server virtualization. LLNL also continues to identify and decommission data centers that are no longer needed.

Additional information on energy conservation goals can be found in the *LLNL FY2015 Site Sustainability Plan* in **Appendix D**.

3.2.5 Pollution Prevention/Sustainability Employee Training and Awareness Programs

The P2S Program conducted awareness activities during the year. Articles on pollution prevention were published in Newsline (LLNL's internal online newsletter), and the P2S Program continued to provide support for implementation of green events. The P2S Program continues to conduct training for purchasing staff on Sustainable Acquisition requirements, and a Green Hotline continues to provide support for employees with questions, suggestions, or ideas regarding LLNL's pollution prevention and waste diversion endeavors, as well as other environmental issues.

P2S worked closely with the food services program to revise and refresh recycling and composting outreach materials and the waste collection areas in the cafeterias. After learning that employees were confused about which cafeteria take-out items were recyclable, compostable, or trash, LLNL's food services program made a commitment to switch all food service ware to compostable products in addition to encouraging use of durable (reusable) goods. The conversion to all compostable products simplified the sorting process for employees and has greatly improved the quality and quantity of waste diversion. The new compostable products were added in 2015 and both cafeteria waste collection areas were renewed with colorful painted wall graphics, updated signs, and collection bins.

In FY2015, together with neighboring Sandia National Laboratory (SNL), the first official Bike to Work Day was organized. Employees were encouraged to bike to work on May 14, 2015 and visit an energizer station during the morning commute. The P2S Program used this event as an opportunity to gather data on number of bike commuters, commute distance, number of days per month each employee bike commuter rides to work, and the number of first time bike commuters. Statistics were also collected through the green hotline for those riders who could not visit the energizer station. The energizer station saw 95 total visitors and 5 were first time bike commuters. When added up, the people who visited the energizer station log 11,261 miles of bike commuting every month.

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