

3. Environmental Program Information



*Constance E. DeGrange
John Celeste
Rebecca A. Failor*

*Robert J. Harrach
Dawn Chase
Karen J. Folks*

Introduction

LLNL is committed to environmental compliance and accountability. The Environmental Protection Department (EPD) leads efforts in this regard. This chapter begins with a description of the missions and activities of EPD and its three divisions. Then Performance Measures (PMs) used by DOE to evaluate the Laboratory's environmental protection efforts are summarized. The bulk of the chapter is devoted to an account of LLNL's activities in the areas of waste minimization and pollution prevention, where significant progress was made in 1995. Following a brief discussion of spills and EPD environmental training, this chapter concludes with mention of LLNL's "other" environmental programs, i.e., those outside EPD.

Environmental Protection Department

As the Laboratory's environmental support organization, EPD prepares and maintains environmental plans and guidelines, provides environmental guidance and support to Laboratory personnel, informs management about pending changes in environmental regulations pertinent to LLNL, represents the Laboratory in day-to-day interactions with regulatory agencies, and assesses the effectiveness of pollution control programs.

EPD conducts monitoring and performs source evaluations and computer modeling to determine the impact of LLNL operations on humans and the environment. In 1995, 18,700 samples were taken from air, sewage, ground water, surface water, soil, sediments, vegetation, and foodstuff, and more than 248,000 analytes were tested. These numbers represent increases of 10% and 5%, respectively, compared to 1994 values. The type of samples collected at a specific location depends on the site and the potential pollutants to be monitored; see the specific chapters of this report for discussions of each environmental medium.

A principal part of EPD's mission is to work with LLNL programs to ensure that operations are conducted in a manner that limits environmental impacts and are in compliance with regulatory guidelines. EPD helps LLNL programs manage and minimize hazardous, radioactive, and mixed wastes; determines the concentrations of environmental contaminants remaining from past activities; cleans up environmental contamination to acceptable standards; responds to emergencies in order to minimize and assess any impact on the environment and the public; and provides training programs to improve the ability of LLNL employees to comply with environmental regulations.



3. Environmental Program Information

LLNL programs are supported by EPD's four Environmental Support Teams (ESTs). Each team includes representatives from environmental specialties within the Operations and Regulatory Affairs Division (ORAD), along with a field technician from Hazardous Waste Management Division (HWM). Some teams also include a representative from the Environmental Restoration Division (ERD), the Environmental Safety and Health Teams (ES&H Teams), or the organizations supported by the ESTs. These teams evaluate operations and provide guidance on environmental regulations and DOE orders for existing and proposed projects. ESTs assist programs in planning, implementing, and operating projects and in understanding and meeting their environmental obligations. When permits are obtained from regulatory agencies, ESTs aid the program in evaluating the permit conditions and implementing record keeping requirements.

In 1995, EPD reorganized from four divisions to three by disbanding the Environmental Monitoring and Analysis Division. During this reorganization environmental monitoring activities, compliance activities under the National Emission Standards for Hazardous Air Pollutants (NESHAPs), and water compliance duties were transferred to the Operations and Regulatory Affairs Division (ORAD). Ground water sampling and its associated data management activities were transferred to ERD. Analytical chemistry functions were transferred outside EPD to the Chemistry and Materials Science Directorate.

Operations and Regulatory Affairs Division

The reorganization of EPD in April 1995 added three groups to ORAD. The nine groups that now compose ORAD specialize in environmental compliance and monitoring and provide laboratory programs with a wide range of information, data, and guidance to make more informed environmental decisions.

ORAD prepares the environmental permit applications and related documents for submittal to federal, state, and local agencies and provides the liaison between LLNL and regulatory agencies conducting inspections; tracks chemical inventories; prepares National Environmental Policy Act (NEPA) documents and conducts related field studies; oversees wetland protection and flood plain management requirements; coordinates cultural and wildlife resource protection and management; facilitates and provides support for the pollution prevention and recycling programs; teaches numerous environmental training courses; coordinates the tank environmental compliance program; conducts compliance, surveillance, and effluent monitoring; and provides environmental impact modeling and analysis, risk assessment, and reporting.

3. Environmental Program Information



ORAD also actively assists in responding to environmental emergencies such as spills. During normal working hours, an Environmental Analyst from the ORAD Environmental Operations Group responds to environmental emergencies and notifies a specially trained Environmental Duty Officer (EDO). EDOs are on duty 24 hours a day and coordinate with LLNL's ES&H Team and other first responders or environmental specialists.

Hazardous Waste Management Division

All hazardous, radioactive, and mixed wastes generated at LLNL facilities are managed by the Hazardous Waste Management (HWM) Division in accordance with state and federal regulations. HWM processes, stores, packages, solidifies, treats, and prepares waste for shipment and disposal, recycling, or discharge to the sanitary sewer.

As part of its waste management activities, HWM tracks and documents the movement of hazardous, mixed, and radioactive wastes from waste accumulation areas (WAAs) located near the waste generator to final disposition; develops and implements approved standard operating procedures; decontaminates LLNL equipment; ensures that containers for shipment of waste meet the specifications of the U.S. Department of Transportation (DOT) and other regulatory agencies; responds to emergencies; and participates in the cleanup of potential hazardous and radioactive spills at LLNL facilities. HWM prepares numerous reports, including the annual and biennial hazardous waste reports required by the state and federal environmental protection agencies. HWM also prepares waste acceptance criteria documents, safety analysis reports, and various waste guidance and management plans.

Responsible for meeting the requirements of the Federal Facilities Compliance Act (FFC Act), HWM establishes regulations requiring the treatment and disposal of mixed waste. The schedule for this treatment is negotiated with the State of California and involves developing new on-site treatment options, as well as finding off-site alternatives.

HWM is responsible for implementing a program directed at eliminating the backlog of Legacy Waste (waste that is not presently certified for disposal). This effort includes a large characterization effort to identify all components of the waste, as well as a certification effort, which will provide the disposal site with appropriate documentation.



3. Environmental Program Information

Environmental Restoration Division

The Environmental Restoration Division (ERD) was established to evaluate and remediate contaminated soil and ground water resulting from past hazardous materials handling and disposal and from leaks and spills that have occurred at the Livermore site and Site 300, both prior to and during LLNL operations. At both the Livermore site and Site 300, ERD investigates field sites to characterize the existence, extent, and impact of contamination. ERD evaluates and develops various remediation technologies, makes recommendations, and implements actions for site restoration. ERD is responsible for managing remedial activities, such as soil removal and ground water extraction, and for assisting in closing inactive facilities in a manner designed to prevent environmental contamination.

In dealing with CERCLA compliance issues, ERD plans, directs, and conducts assessments to determine both the impact of such releases on the environment and the restoration activities needed to reduce contaminant concentrations to protect human health and the environment. ERD is responsible for interacting with the community on these issues. Several public meetings are held each year as required in the ERD CERCLA Community Relations Plans. To comply with CERCLA ground water remedial actions at the Livermore site, ERD has designed and constructed six ground water treatment facilities and associated pipeline networks and wells (Chapter 2). At Site 300, ERD has designed and implemented two soil vapor/ground water extraction and treatment systems and one ground water extraction and treatment system. ERD has also capped two inactive mixed-waste landfills. ERD is actively designing, testing, and applying innovative remediation and assessment technologies to contaminant problems at the Livermore site and Site 300. ERD also provides the sampling and data management support for ground water surveillance and compliance monitoring activities.

Performance Measures Summary

Since 1992, the contract for the University of California to manage and operate LLNL for DOE has contained Performance Objectives, Criteria, and Measures. Eight of these Performance Measures evaluated LLNL's environmental protection activities in 1995. The status of these measures is described in this report at the location referenced in **Table 3-1** below.

In their evaluation of LLNL's fiscal year 1995 self-assessment, DOE and UC reported that LLNL met or exceeded all of the environmental performance measures for the reporting period. Data for calendar year 1995 will be included in the annual self-assessment and evaluation conducted August through October 1996.

3. Environmental Program Information



Table 3-1. DOE environmental protection performance measures.

P.M. designator	Performance measure	Location in this report
1.1.b	<p>Radiation Protection of the Public</p> <p>Public radiation doses to the maximally exposed individual from DOE operations will be measured or calculated and controlled to assure that applicable Federal limits are not exceeded. An effective ALARA program shall be in place to manage dose to the public.</p>	Ch. 13: Radiological Dose Assessment; section on Radiological Doses From Air Emissions.
1.1.g	<p>Process Waste Minimization</p> <p>Jointly, DOE and the Laboratory selected 3 of 5 process waste streams that were the highest generators of waste (hazardous, low-level waste, transuranics or mixed) for 1993 generation data. These 3 waste streams shall continue, at a minimum, to be reduced annually by an average of 5%. Annually, beginning in 1995, the Laboratory will review the previous year's waste generation for the purpose of proposing new waste streams to be added to this performance measure. Progress on new waste streams will initially be tracked to specific milestones agreed upon with the local DOE office. Once the waste minimization efforts are implemented the wastes will at a minimum be reduced annually by an average of 5%, but a larger reduction target will be negotiated for the first implementation year.</p>	This chapter, section on Waste Minimization and Pollution Prevention Performance Measures.
1.1.h	<p>Solid Waste Minimization</p> <p>The Laboratory will decrease annually the aggregate weight of all waste generated sitewide.</p>	This chapter, section on Waste Minimization and Pollution Prevention Performance Measures.
1.1.i	<p>Source Reduction and Pollution Prevention</p> <p>The Laboratory will annually evaluate and prioritize a site-specific number of pollution prevention opportunities and establish milestones/metrics that allow the measurement of progress for each opportunity.</p>	This chapter, section on Waste Minimization and Pollution Prevention Performance Measures.
2.1.a	<p>Tracking and Trending of Findings and Violations</p> <p>The number of validated environmental violations and findings resulting from inspections by regulatory agencies and formal audits will be tracked and trended. A downward trend is expected for each category from the 1993 base year. Changes in regulatory procedures after the 1993 base year that increase or decrease the level of occurrence reporting shall be brought to the attention of UC and DOE as soon as possible and adjustments made to the base year figure, as appropriate.</p>	In Chapter 2, under the heading or subheading "Inspections," by subject area.
2.1.b	<p>Tracking and Trending of Environmental Releases</p> <p>Reportable occurrences of environmental releases exceeding regulatory or permitted levels imposed by local, state or federal agencies will be determined and trended. A downward trend is expected. Changes in regulatory procedures after the 1993 base year that increase or decrease the level of occurrence reporting shall be brought to the attention of UC and DOE as soon as possible and adjustments made to the base year figure, as appropriate.</p>	All releases are described in the list of Environmental Occurrences in Ch. 2, Table 2-5.

...concluded on next page



3. Environmental Program Information

Table 3-1. DOE environmental protection performance measures (concluded).

P.M. designator	Performance measure	Location in this report
2.2.a	Regulatory Commitments All funded regulatory consent agreement milestones will be met. If such milestones cannot be met, the Laboratory must inform the University and DOE in writing at the earliest possible time before the milestone passes and seek written concurrence from the appropriate regulatory agency on a revised schedule.	In Ch. 2, section on Livermore Site Ground Water Project, Required Documentation, and section on Site 300 Environmental Restoration Program, Documentation.
5.1.a	Regulator Satisfaction At least once per year, the Laboratory will interview key external regulators utilizing a pre-established and consistently used customer survey questionnaire.	Questionnaires were delivered to two agencies in 1995: BAAQMD and DTSC. Results will be analyzed by DOE and UC in 1996.

DOE Pollution Prevention Goals

The Department of Energy embraces pollution prevention as its strategy to reduce the generation of all waste streams and thus minimize the impact of Departmental operations on the environment. Preventing pollution also reduces risks to the health and safety of workers and the general public, and saves scarce budget dollars. To demonstrate the Department's commitment to pollution prevention, DOE set the following goals, relative to 1993 as a baseline year, to be achieved by December 31, 1999:

For routine operations:

- Reduce the generation of radioactive waste by 50%.
- Reduce the generation of low-level mixed waste by 50%.
- Reduce generation of hazardous waste by 50%.
- Reduce the generation of sanitary waste by 33%.
- Reduce total releases and transfers for treatment and disposal of EPCRA 313 toxic chemicals by 50%.

For all operations, including cleanup/stabilization activities:

- Divert for recycling 33% of sanitary wastes.

For affirmation procurement:

- Increase procurement of EPA-designated, recycled products to 100% except where they are not available competitively at a reasonable price or do not meet performance standards.

3. Environmental Program Information



Waste Minimization and Pollution Prevention Awareness Plan

In order to implement LLNL's Waste Minimization Policy, EPD provides technical guidance to LLNL programs to help them plan pollution prevention projects and select and design waste-reduction technologies and equipment. These ongoing efforts identify substitutes for hazardous materials used in experimentation in order to reduce the quantity of hazardous waste generated at LLNL; they also identify areas where research and development efforts are necessary to develop suitable alternatives to materials and processes that produce waste.

LLNL prepared a Waste Minimization and Pollution Prevention Awareness (WMPPA) Plan, which meets the requirements of (1) DOE Orders 5820.2A and 5400.1; (2) RCRA, Sections 3002(b) and 3005(h); and (3) Title 22 of the California Code of Regulations. This Plan is reviewed annually and updated every 3 years; it was last updated and submitted to the DOE in July 1994. The Plan reviews past and current waste minimization activities and states the objectives of LLNL's waste minimization and pollution prevention efforts.

The strategies proposed in the WMPPA Plan are being implemented by two actions. The first action is to develop specific ways for the programs to prevent pollution, conserve resources, and minimize waste generation. This action includes creating incentives for pollution prevention; developing specific goals and schedules for waste minimization activities; promoting the use of nonhazardous materials; substituting, reformulating, modifying, managing, and/or recycling waste materials to achieve minimal adverse effects; targeting policies, procedures, or practices that may present barriers to waste minimization; and integrating and coordinating waste generators' and waste managers' activities on waste minimization issues.

A primary way that this action is currently being implemented is through the use of Pollution Prevention Opportunity Assessments (PPOAs). These PPOAs provide a systematic methodology for identifying cost-effective pollution prevention projects for which funding is requested. In addition, the PPOAs identify technology gaps or improvements to existing technology that may reduce pollution. The net effect of conducting PPOAs has been to increase the awareness of LLNL programs to pollution prevention opportunities.

A second action implementing the strategies proposed in the WMPPA Plan is to enhance communication of waste minimization goals and ideas. This involves developing and implementing employee pollution prevention awareness and occupational training programs, collecting and exchanging waste minimization information through technology transfer outreach and educational networks, and developing mechanisms for disseminating current technical information.



3. Environmental Program Information

These efforts are included in periodic publications, such as EPD's *Waste Matters*, LLNL's *Newsline*, and DOE's *Pollution Prevention Advisor*; booths at the April 1995 LLNL Earth Day Fair and at the October 1995 LLNL Energy Fair; continuation of basic guidance through environmental training courses; and development of a "home page" for the dissemination of pollution prevention information on the Internet. In addition, LLNL has developed two pollution prevention video tapes for use in new employee orientation, environmental training, and small-group discussions.

LLNL provides reports on waste minimization, pollution prevention, and recycling to DOE, the State of California, and local agencies when requested. Two of the major efforts in 1995 were a report on waste generation and waste minimization progress for 1994, as requested by DOE for both the Livermore site and Site 300, and the Source-Reduction Evaluation Review and Plan Summary, an update to the California Senate Bill 14 (SB14) reports. Additionally, the University of California Contract 48, Appendix F, Performance Measures require waste minimization tracking and reporting on a quarterly basis.

Waste Minimization/ Pollution Prevention Performance Measures

LLNL's waste minimization and pollution prevention strategies have evolved over the last decade from ones focused on reactive measures (abatement, treatment, cleanup, and monitoring) to proactive ones of waste minimization and pollution prevention. LLNL's successes in waste reduction and pollution prevention are well illustrated by the accomplishments described in this and the following section on "Other Significant Pollution Prevention and Waste Management Accomplishments."

LLNL operated under three waste minimization/pollution prevention Performance Measures in 1995, falling under the headings Process Waste Minimization, Solid Waste Minimization, and Source Reduction and Pollution Prevention.

Process Waste Minimization

As indicated in **Table 3-1**, DOE and the Laboratory jointly selected three of five process waste streams that were the highest generators of waste (hazardous waste, low-level waste, and mixed waste) for 1993 generation data. LLNL successfully met the goal of reducing the three agreed-upon process waste streams by an average of 5% per year. LLNL and DOE have agreed on the waste streams to be reduced next year and the percentage reduction. Tracking of two more waste streams (from the uranium enrichment operations) may be added to the performance measure next year.

3. Environmental Program Information



Process Waste Streams

During 1995, LLNL continued efforts to reduce the three process waste streams that were first selected for reduction in 1993. These were contaminated gravel and debris from the firing tables at Site 300, spent aqueous coolant from the Engineering machine shop, and aqueous liquids from the Plant Engineering paint shop.

Gravel from Firing Tables

A gravel washer has been utilized to recondition used gravel that had been generated by operations on the firing tables in previous years. To date the gravel washer has processed 60,000 kg of used gravel and produced 52,000 kg of reusable gravel; a recovery rate of 87%. This recovery rate may increase when the most recent gravel is processed because of improvements in presorting. The gravel washer and the gravel reuse effort are considered to be successful by both DOE and LLNL. The waste from explosive testing has been reduced from over 253,000 kg of mixed waste in 1989 to 54,000 kg of low-level waste in 1995.

Machine Shop Coolant

Throughout 1995, tests were performed on semisynthetic and synthetic coolants to replace the current coolant used in machine shops. To date, three machines are now using the semisynthetic and three machines the 100% synthetic coolants. Because LLNL is still improving the way the machining coolant is handled, DOE and LLNL have agreed to continue to track this waste stream in 1996. Engineering has installed a product recovery unit that recovers about 80% of the low-level coolant for reuse.

Aqueous Liquids from the Paint Shop

In 1995, no aqueous waste was generated from the paint shop, and a micro-separator performed as expected; this waste will not be tracked in 1996. Hazardous aqueous waste from the paint shop was reduced from about 12,000 kg in 1993 to zero in 1995.

Solid Waste Minimization

Through extensive efforts in 1995 to reduce the amount of waste generated and to recycle unwanted material rather than disposing of it as waste, LLNL was able to achieve a 12.5% reduction in the amount of waste disposed in 1994. In 1995,



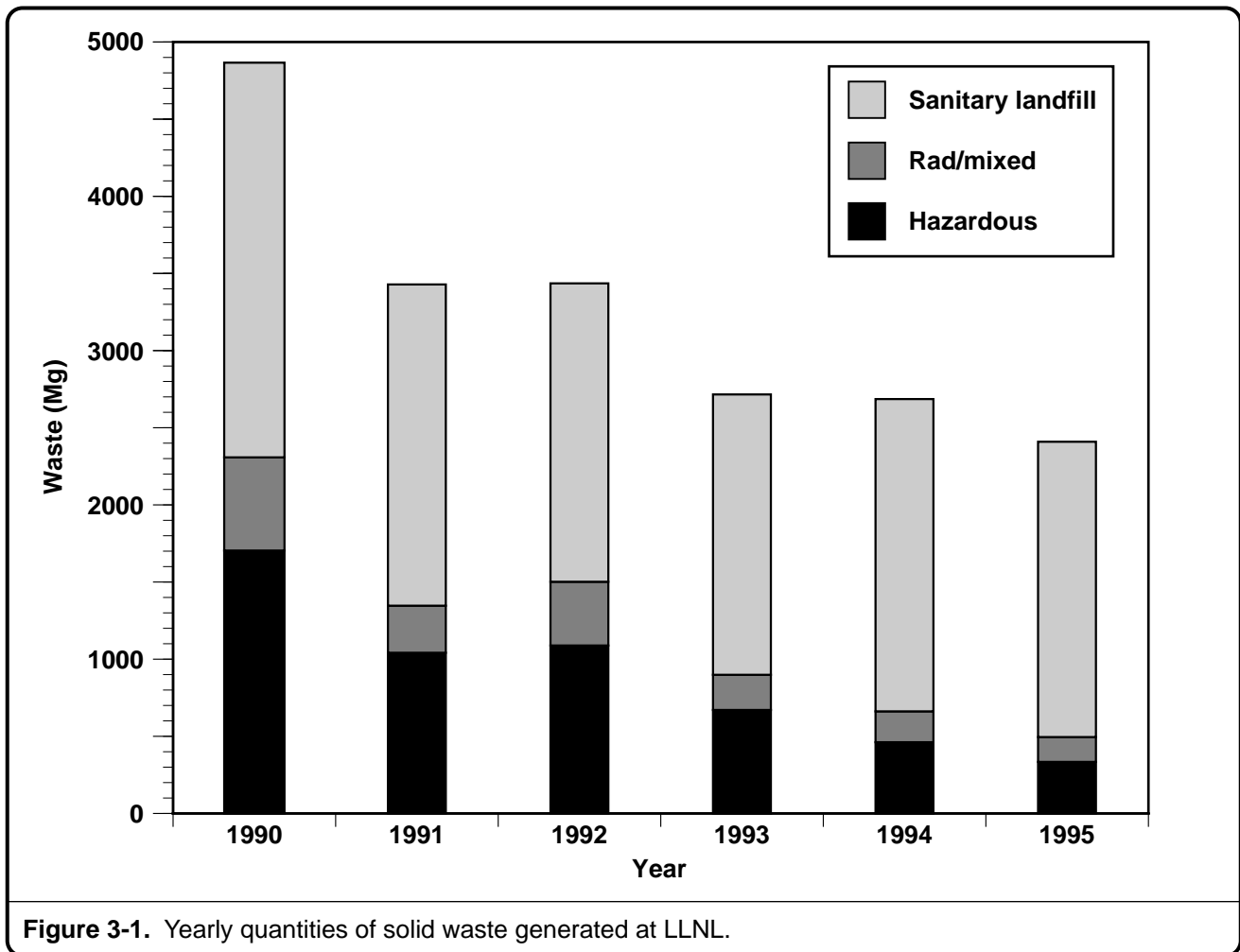
3. Environmental Program Information

for the second year, material going to the landfill was accurately measured using a consistent method. The nature of the waste generated in 1995 is directly comparable to that generated in 1994.

The aggregate waste generated in 1995 was about 2.5 million kg versus 2.9 million kg in 1994, a 12.5% reduction (**Figure 3-1**).

One of the major contributions to this achievement was a reduction of 115,000 kg in the nonhazardous (compacted) waste disposed of at the sanitary landfill. This change was due in part to the sitewide cardboard recycling program.

Hazardous waste generated during 1995 was 334,000 versus 463,000 kg in 1994 (27.8% reduction).



3. Environmental Program Information



Although not part of this performance measure, LLNL did have an increase in the amount of decontamination and decommissioning waste produced. The increase from 199 to 583 tons was due to the demolition of Building 435 cooling towers and the removal of contaminated soil from Building 404. The equipment from the cooling tower demolition, such as heat exchangers, pumps, piping, and valves, was sold as scrap metal. In addition, LLNL shipped some accumulated low-level certified waste for off-site disposal. Since this waste was generated in previous years it was not included in the total for 1995 radioactive waste generated.

Diverted Waste

The total quantity of potential waste that was diverted from the landfills and recycled off site was 3.1 million kg for calendar year 1995 versus 2.3 million kg for calendar year 1994: a 32% increase in the quantity diverted. LLNL achieved these impressive figures as a result of recycling programs focused on office paper, batteries, ferrous material, cardboard, newspaper, magazines, and tires.

The amount of hazardous material shipped off site for recycling by the Hazardous Waste Management Division decreased from 381,000 to 284,000 kg. Asphalt removed from the Livermore site, which was previously taken to the landfill, is now used as road base in road construction at the landfill. The amount of asphalt reused in this fashion was 622,000 kg in calendar year 1995.

Table 3-2 summarizes the recycling activity. In this table, the line entitled Donation, Utilization, and Sales includes ferrous and nonferrous metals, copper, tires, magazines and newspaper, all of which are recycled. The term "paper" includes office paper and baled paper from the hammermill. Office paper includes recycled white and colored paper.

Source Reduction and Pollution Prevention

The Laboratory surveyed its operations for opportunities related to source reduction and pollution prevention in 1995. Annually, effective with fiscal year 1996, the Laboratory will continue to survey on-site operations for opportunities to eliminate, reduce, recover, or recycle potential pollutants to all media, including air, water, soil, sediments, and biota.

NOx Reduction

Oxides of nitrogen (NOx) account for about half of the total toxic gas emissions from LLNL (see Chapter 5). Boilers continue to be the most significant source of air pollutant emissions, accounting for over 60% of all NOx.



3. Environmental Program Information

Table 3-2. Recycling summary in kilograms of material.

Recycled items	Weight (kg)		
	1993	1994	1995
Hazardous waste management	80,739	381,018	283,949
Donation, Utilization, and Sales (DUS)	1,087,714	1,104,044	1,289,109
Wood	380,110	488,065	368,317
Cardboard	40,823	46,266	136,985
Asphalt	NA	NA	622,329
Toner cartridges	NA	2721	1814 ^(a)
Paper	355,616	283,949	334,751
Batteries	22,680 ^(b)	23,587	34,473
Total	1,967,300	2,329,650	3,071,727

NA = Not available.

^a Weight has been estimated based on volume.

^b Prior to 1994, LLNL recycled only "wet" type batteries.

Four boilers were scheduled to be either replaced or retrofitted with low NOx burners. Two boilers in Building 231 were retrofitted with low NOx burners in December 1995. The effort to replace the other two boilers (Building 131) continued into 1996.

LLNL has looked at additional boilers for potential replacement. Boilers that use 1.5 megawatts or more of power provide a major opportunity for further NOx reductions. LLNL has identified 13 boilers in the 1.5 megawatt or greater range that could be retrofitted or replaced with low NOx burners. However, their replacement is not required under law, and their retrofitting costs are estimated to exceed 1 million dollars. Since boilers represent such a large portion of the air emissions, these smaller boilers are the most likely candidates for future replacement or retrofitting.

Toxic Reporting Inventory information

LLNL has been active in reducing its use of ozone-depleting chemicals. Use of chlorofluorocarbons (CFCs) for degreasing applications in Engineering's main machining facilities was reduced to less than 4 L/y. Other CFC degreasing operations in Chemistry and Materials Science, Lasers, and Engineering are being studied, with the aim of totally eliminating CFC usage.

The largest CFC usage at LLNL continues to be as dielectric and coolant media. Most of this use has been in Laser Isotope Separation applications, in which the

3. Environmental Program Information



dielectric properties of CFC 113 are important. The program has, however, reengineered some electrical components to allow mineral oil to be substituted for CFCs, and is also testing other chemicals as possible replacements.

Plant Operations employs CFCs as refrigerants and is actively replacing or retrofitting refrigeration units with alternative, non-ozone-depleting chemicals.

Other Significant Pollution Prevention and Waste Management Accomplish- ments

A major part of LLNL's efforts to reduce waste has been to reduce hazardous organic solvents (such as CFCs as discussed above or halogenated hydrocarbons) that are disposed of as liquid hazardous waste or that may evaporate into the air. To date, approximately 25 shops or laboratories on site have converted to environmentally friendly chemicals in their cleaning operations.

A contamination analysis sensor is currently being developed to measure the cleaning performance of different solvents in near-real time, which will help redesign cleaning processes to be more efficient and present fewer environmental risks. The sensor will be field tested in the aerospace and electronics industry in the coming year, and a patent is pending.

LLNL won a national award from DOE in 1995 for its success in recycling hazardous material and for the operation of its Chemical Exchange Warehouse (CHEW). LLNL continues to operate CHEW to receive, temporarily store, and track excess usable chemicals in order to make them available to other users. By reusing chemicals, the hazardous waste stream is lessened, thereby reducing chemical procurement and disposal costs.

LLNL is procuring a recycling unit for its ethanol laser dye solution, and its CFC 113 recycling unit will be upgraded and brought online. Recycling this dielectric coolant on site will increase the amount of recovered coolant compared to previous off-site recycling. Carbon dioxide cleaning is becoming the cornerstone cleaning technology for LLNL's National Ignition Facility. Work continues to evaluate the use of carbon dioxide snow and pellet sprays for precision cleaning of optics, electronics, and other assemblies. After cleaning, the carbon dioxide sublimates, leaving no solvent waste. The Laser Program has also replaced paper protective clothing with washable clothing and is now laundering this on site instead of disposing of the used paper clothing as low-level waste. Lasers Directorate is using an additional ethanol recycling unit on the Nova project, where ethanol is used with optics processing.

Many LLNL programs and directorates have recently implemented significant pollution prevention technologies. For example, the Electronics Engineering Department has improved pollution control at its Rapid Prototype Facility (RPF), one of several on-site electronics fabrication facilities. Aqueous solvents and alter-



3. Environmental Program Information

native cleaning equipment have decreased air emission and hazardous waste sources. Plant Engineering has replaced a CFC degreaser in its instrument shop with a triple-rinse aqueous system, cutting CFC use by 1500 L/y. The Chemistry and Materials Science Directorate has recycled acetone in aerogel fabrication, purchased oil-less vacuum pumps to eliminate used vacuum pump oil as a hazardous waste, and replaced a toluene-based cocktail used in low-level radioactive sample analysis with a nonhazardous aqueous-based scintillation cocktail.

Other EPD waste management highlights include the following:

- Completed sampling and characterization of over 250 drums of depleted uranium and repackaged approximately 60 drums for shipment to the Scientific Ecology Group.
- Shipped 74 boxes of mixed waste to Envirocare of Utah, our first mixed waste shipment to a commercial disposal facility.
- Completed real-time radiography of approximately 920 drums of radioactive waste.
- Significantly increased the speed (up to a factor of 30) of the Total Waste Management System database by moving it to a far more powerful computer system.

Spill Reporting

The Federal government and the State of California have several distinct statutory and regulatory provisions that require responsible persons to report releases or threatened releases of hazardous materials or pollutants into the environment. DOE has also established various Orders that require reporting of incidents to DOE Headquarters. Applicable rules, regulations, and DOE Orders are summarized below in **Table 3-3**. These provisions have varying requirements as to the types of releases that must be reported, the timing of the report or notification (immediate and follow-up), the content of the report (e.g., source of the release, nature of the material, and the quantity released), and the particular agencies that must be notified. Many releases must be reported under more than one provision, and compliance with one provision will not necessarily satisfy another applicable provision.

Under authority of the *San Francisco Bay Water Quality Control Plan*, the San Francisco Bay RWQCB requires a report of all releases to the ground or surface waters that are not specifically allowed in permits. LLNL followed a reporting procedure established by the San Francisco Bay RWQCB that identifies the types of spills that must be reported, and when the spills are considered to be of so little consequence that records can be kept on file and noted in the routine quarterly reports. If a spill of a reportable quantity of material occurs or the material is not contained, the appropriate agencies are contacted immediately.

3. Environmental Program Information



Table 3-3. Laws, regulations, and DOE Orders that include spill reporting requirements.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or "Superfund Act"
Superfund Amendments and Reauthorization Act (SARA)
Toxic Substance Control Act (TSCA)
The Federal Water Pollution Control Act, or Clean Water Act
Resource Conservation and Recovery Act (RCRA)
Resource Conservation and Recovery Act "Underground Storage Tanks"
California Hazardous Waste Control Law, California Code of Regulations, Title 22, Division 4.5
California Hazardous Waste Control Law, California Code of Regulations, Title 23, Chapter 16, Underground Tank Regulations
California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapter 6.95, Business Plan
California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapter 6.67, Aboveground Petroleum Storage Act
California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapter 6.8, Hazardous Substance Account Act
Porter-Cologne Water Quality Control Act, California Water Code, Division 7, Chapter 4
Industrial Waste Water Discharge
Federal and State Clean Air Acts
Department of Energy Orders
Atomic Energy Act

Response to Spills and Other Environmental Emergencies

All spills and leaks (releases) that are potentially hazardous to the environment are investigated and evaluated. The release response process includes identifying the release, shutting off the source (if safe to do so), eliminating ignition sources, contacting appropriate emergency personnel, cordoning off the area containing the released material, absorbing and neutralizing the released material, assisting in cleanup, determining if a release must be reported to regulatory agencies, and verifying that cleanup (including decontaminating and replenishing spill equipment) is complete. Environmental analysts provide guidance to the programs on preventing spill recurrence.

To maximize efficient and effective emergency environmental response, EPD established a 7-days-a week, 24-hours-a-day, on-call rotational position entitled the Environmental Duty Officer (EDO). Specialized EDO training includes simulated accidents to provide the staff with the experience of working together



3. Environmental Program Information

to resolve environmental issues within the regulatory structure. The on-duty EDO can be reached by pager or cellular phone at any time .

During normal work hours, Laboratory employees report all environmental incidents to the Environmental Operations Group (EOG) Environmental Analyst (EA) assigned to support their program area. The EOG EA then notifies the on-duty EDO of the incident and together they determine applicable reporting requirements to local, state, and federal regulatory agencies and to the DOE. The EDO and the EOG EA also notify and consult with program management, and have 7-days-a-week, 24-hours-a-day access to the office of Laboratory Counsel for questions concerning regulatory reporting requirements.

During off-hours, Laboratory employees report all environmental incidents to the Fire Dispatcher, who, in turn, notifies the EDO and possibly the Fire Department. The EDO then calls out additional EPD support to the incident scene as necessary, and follows the same procedures as outlined above for normal work hours.

Environmental Training

Major efforts are ongoing to provide LLNL employees with training on environmental topics aimed at improved compliance. Training tasks address both specialized training for environmental professionals and training in a variety of environmental topics for employees at all levels throughout LLNL. Courses presented by EPD's Training Section are listed in **Table 3-4**.

LLNL's Other Environmental Programs

Integral to LLNL's environmental research is the Environmental Programs Directorate that conducts multidisciplinary research to assess and mitigate environmental and human risk from natural and man-made hazards and to develop and demonstrate new tools and technologies for environmental restoration. This work includes studies in: the design, analysis, and testing of advanced waste-treatment technologies; *in-situ* environmental remediation using natural and engineered processes; pathway, dosimetry, and risk analysis of radioactive and toxic substances; atmospheric dynamics; subsurface imaging and characterization; and seismic processes.

In 1995, LLNL formed its Council on Energy and Environmental Systems to coordinate and direct the Lab's wide range of environmental research activities. To develop a core mission area of global ecology, a two-year position was established creating a Director of Energy and Environmental Systems, to develop and integrate our research in these areas.

3. Environmental Program Information



Table 3-4. EPD training courses.

Administrative Operations Pollution Prevention*	Air Source Management
Diversity Training*	Environmental Duty Officer Briefings
Environmental Law and Regulation	General Awareness/Familiarization
Hazardous 90-Days Waste Retention Tank Management*	General Requisition Briefing*
Hazardous Waste Generation and Certification	Hazardous Waste Sampling
Hazardous Waste Transportation	Identification of Hazardous Material
Labeling of Packages	Land Disposal Restriction*
Low-Level Waste Certification Overview	Low-Level Waste Generation and Certification
Low-Level Waste Generation and Certification of Encapsulated Uranium Waste*	Marking of Packages
Overview of Environmental Law and Regulation	Packaging Operations
Placarding: Hazardous Waste Transport	Pollution Prevention for Facility Design
Radioactive Materials	RCRA Facility Management
RCRA Operations	Requisition Training*
Safety	SARA/OSHA Refresher Training
SARA/OSHA Supervisory Training	SARA/OSHA Training 40 Hour
Separation for Highway Transport	Shipping Papers
TRU Waste Generation and Certification	Unique Moves
Waste Accumulation Area Operations	

*New training classes in 1995.

As part of this effort an Industrial Ecology Program was established, whose goals are to:

- Support and develop multidisciplinary programs, which create the scientific and technological basis for achieving an environmentally and economically efficient, and sustainable, global economy. Work with the DOE and others to develop an integrated, science-based program that addresses the future environmental, energy, and economic security of the Nation.
- Encourage and contribute to the development of responsible, technically and scientifically valid, cost-effective environmental laws, regulations, standards, practices, and methodologies.
- Promote the conservation of raw materials and other natural resources: Eliminate or reduce waste and emissions; recycle and reuse materials, components, and products; and purchase recycled products.



3. Environmental Program Information

- Integrate applicable environmental considerations into our research and development activities, business decisions, and planning activities, including decisions on projects, products, processes, and purchases.
- Research, develop, and exploit environmentally and economically efficient technology and technological systems and analysis tools as a principal means of implementing this policy.
- Utilize a lifecycle, systems-based approach in implementing this policy.

While EPD plays a central role, every directorate at LLNL is responsible for environmental compliance and minimizing the impacts of its operations. Several directorates have taken particularly noteworthy steps in this direction. These include the plans for Defense Nuclear Technologies Program's Contained Firing Facility at Site 300 that will move explosive tests inside a facility where the debris is contained, the Laser Program's efforts to design the National Ignition Facility to have minimal environmental impact, Engineering's Metal Finishing Group's efforts to reduce waste and substitute less hazardous chemicals in many of their processes, and Education Program's efforts to enhance environmental education, to name just a few.