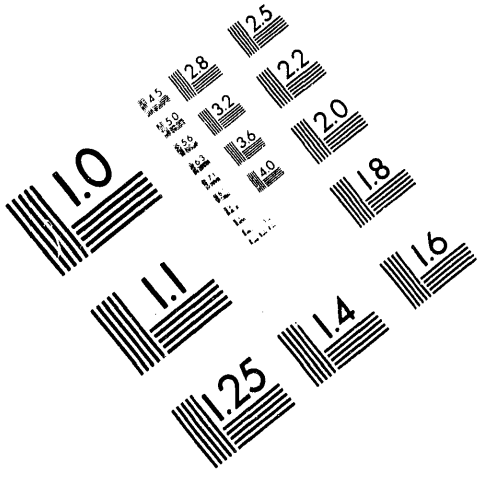

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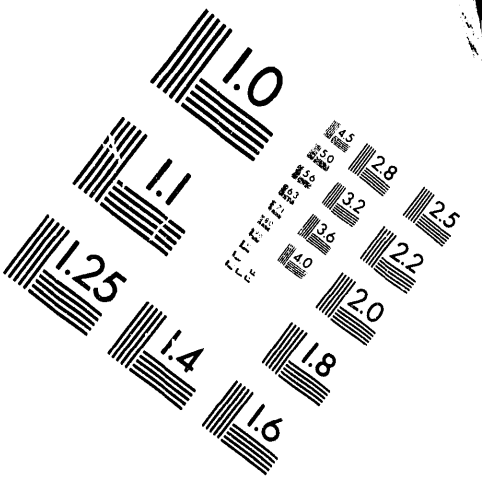

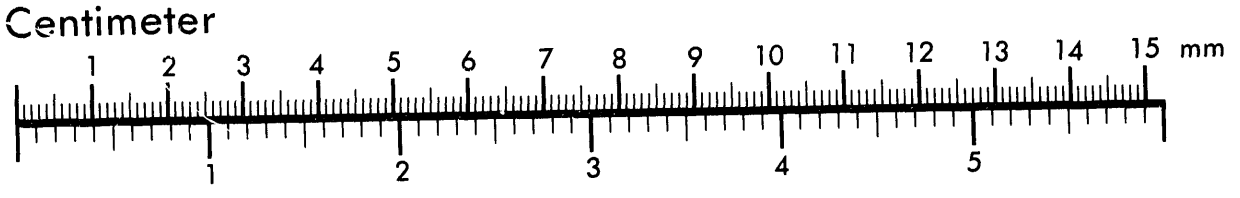

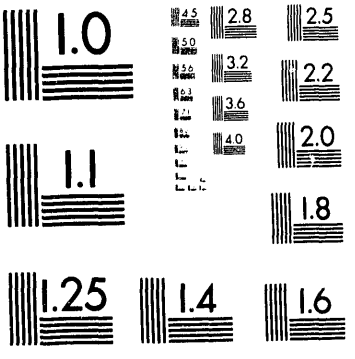

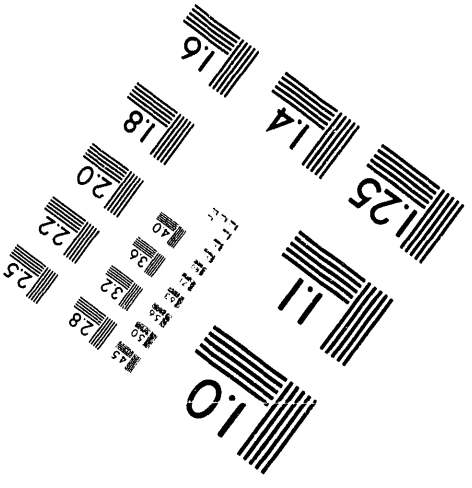

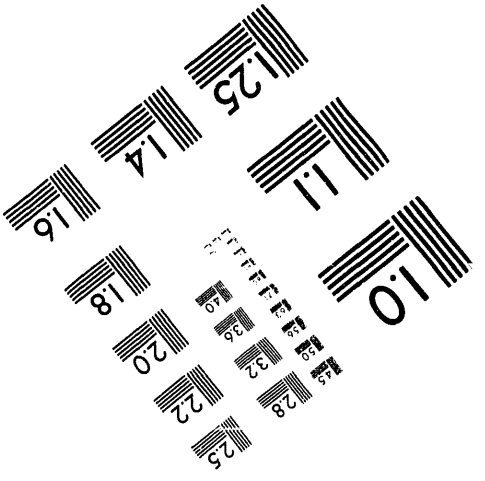

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Environmental Protection Department
Operations & Regulatory Affairs Division

Waste Minimization and Pollution Prevention Awareness Plan

May 31, 1992

Environmental Protection Department
Operations and Regulatory Affairs Division
Waste Minimization Program

Lawrence Livermore National Laboratory
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CONTENTS

I. INTRODUCTION/BACKGROUND

A. Purpose of Plan

The purpose of this plan is to document the Lawrence Livermore National Laboratory (LLNL) Waste Minimization and Pollution Prevention Awareness Program. The plan specifies those activities and methods that are or will be employed to reduce the quantity and toxicity of wastes generated at the site. It is intended to satisfy Department of Energy (DOE) and other legal requirements that are discussed in Section C, below. The Pollution Prevention Awareness Program is included with the Waste Minimization Program as suggested by DOE Order 5400.1. The intent of this plan is to respond to and comply with the Department's policy and guidelines concerning the need for pollution prevention.

The Plan is composed of a LLNL Waste Minimization and Pollution Prevention Awareness Program Plan and, as attachments, Directorate-, Program- and Department-specific waste minimization plans. This format reflects the fact that waste minimization is considered a line management responsibility and is to be addressed by each of the Directorates, Programs and Departments. Several Directorates have been reorganized, necessitating changes in the Directorate plans that were published in 1991.

B. Changes Since Original Plan Issue

This Plan was originally issued on May 31, 1991. However, there have been significant changes in both regulatory requirements and Laboratory operations that affect the Waste Minimization and Pollution Prevention Awareness Program. As required by DOE, the Plan has been updated to reflect changes since the original issue. Some of the significant changes are identified below:

- California has passed a new law requiring reporting of recycled nonRCRA wastes.
- EPA issued instructions for reporting under the Pollution Prevention Act of 1990 that will require significant modifications of the existing LLNL hazardous waste data reporting procedures.
- The largest hazardous waste streams have been identified and waste minimization options selected, with a public commitment to implement these under the California Hazardous Waste Management and Source Reduction Review Act.
- DOE reduced the level of radioactivity that defines wastes as either radioactive or mixed.
- New restrictions have been applied to the generation of mixed wastes because of Land Ban.
- New local air emissions offset requirements have increased the difficulty of obtaining air permits.

- An Executive Order issued in September, 1991 requires new emphasis on the use of recycled materials by all Federal facilities.
- California has increased restrictions on the quantities of nonhazardous wastes that may be disposed of in landfills.
- The Secretary of Energy directed all DOE facilities to participate in the EPA 33/50 program to reduce emissions of 17 priority chemicals, and to submit progress reports.
- The Secretary of Energy directed all DOE facilities to phase out Class I ozone-depleting chemicals (ODCs) by the end of 1995, and to submit progress reports.

C. Scope of Plan

A waste minimization program is an organized, comprehensive, and continual effort to systematically reduce waste generation. The LLNL Waste Minimization and Pollution Prevention Awareness Program is designed to eliminate or minimize pollutants released as a consequence of the Laboratory's operation. The purpose is to protect public health and the environment, as well as to:

- Reduce waste management and compliance costs
- Reduce resource usage
- Improve product yields
- Reduce or eliminate inventories and releases of hazardous chemicals reportable under the Emergency Planning and Community Right-to-Know Act
- Reduce or eliminate the Laboratory's civil and criminal liability under existing environmental laws
- Initiate use of recycled materials, in compliance with Executive Order 12780, "Federal Agency Recycling and the Council on Federal Recycling and Procurement Policy."

The program reflects the Laboratory's goals and policies for waste minimization, and represents an ongoing effort to incorporate pollution prevention and waste minimization into the site's operating philosophy. In accordance with DOE policy, a hierarchical approach to waste reduction has been adopted and is applied to all types of waste.

Waste minimization will be accomplished by eliminating or minimizing the generation of waste through source reduction. When possible, those potential waste materials that cannot be eliminated or minimized will be recycled (i.e., used, reused, or reclaimed). Any waste that is generated will be treated as appropriate to reduce volume, toxicity, or mobility before storage or disposal.

The scope of this plan is confined to source reduction, material substitution, and environmentally sound recycling. Methods for treatment of waste are covered in other directives.

The plan is a reference tool and guidance document for managers, operations personnel, and support staff. It contains the policy, objectives, strategy, and support activities of the Waste Minimization and Pollution Prevention Awareness Program. One way discussed is to raise the awareness of the employees concerning minimization techniques; another way is to train employees to reduce waste and still meet the programmatic requirements for quality, productivity, safety, and environmental compliance.

This plan applies to all site operations and associated support operations. It will be reviewed annually and revised as necessary. At a minimum, the plan will be updated every 3 years.

The plan will be available to affected employees and site contractors; and the policy, goals, objectives, and strategy of the plan will be communicated to all employees.

D. Legal and Policy Background

The Resource Conservation and Recovery Act (RCRA) requires hazardous waste generators to establish a program to reduce the volume or toxicity of waste to the degree determined by the generator to be "economically practicable." Hazardous waste generators must certify in their waste manifest that this requirement has been fulfilled. Generators must also identify in their biennial reports to the Environmental Protection Agency (EPA) and the State of California their efforts to reduce the volume and toxicity of waste and the changes in volume and toxicity actually achieved. Under the Pollution Prevention Act (PPA) of 1990, waste generators must report waste minimization results in their annual submission of toxic chemical release inventories to EPA.[1]

The California Hazardous Waste Source Reduction and Management Review Act of 1989 (often referred to as SB14) requires any business that generates more than 12,000 kg of Hazardous Waste or 12 kg of Extremely Hazardous Waste to prepare reports concerning its waste management practices and its specific plans to reduce generation of those waste streams that exceed 5 percent of the total. These reports, which are available for public review, were issued by LLNL for both the Main Site and Site 300 on September 15, 1991. By law, they must be amended whenever there are changes to the implementation plans and must be re-issued every four years.

California Assembly Bill 1475, which was approved by the Governor in 1992, requires businesses to report biennially the quantities of nonRCRA hazardous wastes that they

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[1] The Pollution Prevention Act allows EPA to implement this requirement based on the Standard Industrial Classification of the generator. LLNL was not required to submit this report in 1992.

send to recyclers. These reports are sent to a local agency, which for LLNL is the Alameda County Public Health Service, Hazardous Materials Division.

The 1990 CAA directed the phase-out of chemicals that have been defined as stratospheric ozone depleting chemicals (ODCs). Specifically, Title VI of this act named most of the common chlorofluorocarbons (CFCs), Halons, carbon tetrachloride, and methyl chloroform (1,1,1-trichloroethane) as Class I substances, whose production shall be eliminated in the United States by the year 2000. Hydrochlorofluorocarbons (HCFCs), which have been proposed as less hazardous alternatives to CFCs because of their lower ozone depletion potential (ODP), were designated as Class II substances, to be eliminated by the year 2015. The effect of this part of the CAA was to force businesses that used these chemicals to find alternative processes. LLNL has used CFCs, and methyl chloroform as solvents, and used Halons in fire protection equipment.

California Assembly Bill 939 was enacted in 1989 to regulate the construction and operation of landfills. It was also intended to maximize source reduction, recycling and composting of non-hazardous solid wastes. Although this law directly affects county governments, in 1992, the California Legislature passed Assembly Concurrent Resolution 149, which asked the University of California to participate in AB 939.

DOE Orders 5400.1, 5400.3, and 5820.2A mandate that radioactive wastes and other pollutants shall be managed in a manner that minimizes the generation of such wastes.

DOE Order 5400.1 establishes environmental protection program requirements and responsibilities for assuring compliance with environmental protection laws. The Order requires the establishment of a waste minimization program "that will contain goals for minimizing the volume and toxicity of all wastes that are generated" and a Pollution Prevention Awareness Program. The Waste Minimization Program and the Pollution Prevention Awareness Programs are to be established through implementing plans. The implementing guidance permits the two programs and implementing plans to be consolidated.

DOE Order 5400.3 establishes DOE hazardous and radioactive mixed waste policies and requirements and implements the requirements of RCRA within the framework of the environmental programs established under DOE Order 5400.1. The Order states that it is DOE policy to "implement waste minimization measures as specified in RCRA for hazardous and radioactive mixed wastes." The Order requires the Heads of Field Organizations to "implement a waste minimization program for hazardous and radioactive mixed wastes."

DOE Order 5820.2A establishes policies, guidelines, and minimum requirements by which DOE manages its radioactive and mixed waste and contaminated facilities. It states that the "generation, treatment, storage, transportation, and/or disposal of radioactive wastes, and the other pollutants or hazardous substances they contain, shall be accomplished in a manner that minimizes the generation of such wastes across

program office functions and complies with all applicable Federal, state, and local environmental, safety, and health laws and regulations and DOE requirements." The Order requires the preparation of a waste management plan for each site that generates, treats, stores, or disposes of DOE wastes. The waste management plan "will indicate actions (taken) to minimize hazardous waste generation."

DOE Order 5820.2A contains specific waste minimization requirements for management of high-level, transuranic, and low-level waste. These requirements include process modification, process optimization, and materials substitution.

DOE's Waste Reduction Policy Statement requires all DOE Program Offices and Field Operations to "institute a waste reduction policy to reduce the total amount of waste that is generated and disposed of by DOE operating facilities through waste minimization (source reduction and recycling) and waste treatment." The policy consolidates the requirements of DOE Orders 5400.1, 5400.3, and 5820.2A for either a waste minimization or a waste reduction plan and attaches guidance for satisfying the reporting requirements of those orders. The statement adopts the hierarchical approach to waste reduction and applies the policy to all types of waste. The policy requires waste reduction to be an important consideration in research activities, process design, and facility design and operations.

The DOE Waste Minimization Crosscut Plan and the Waste Minimization and Pollution Prevention Executive Board were formally implemented by SEN-37-92 on May 13, 1992. The Board reports to the Secretary of Energy, and is responsible for developing and coordinating effective waste minimization and pollution prevention programs for all of DOE (Watkins, 1992). The purpose of the Crosscut Plan is to coordinate waste minimization activities throughout DOE. Activities to be funded under the Crosscut Plan need to meet one or more of the following objectives:

1. Create a culture change within DOE for conserving resources and minimizing waste.
2. Identify waste minimization options.
3. Develop and set specific goals for waste minimization.
4. Identify and develop technologies and exchange information.
5. Apply waste minimization in design, development and production.
6. Increase competitiveness of U. S. industry.
7. Establish a positive, credible image for DOE.

E. Mission and Site Description

The Lawrence Livermore National Laboratory is owned by the U.S. Government and is operated by the University of California under a prime operating contract, W-7405-Eng-48, with the U.S. Department of Energy (DOE).

The Laboratory has two sites, a main site (the Livermore site) and a hydrodynamics test range area referred to as Site 300. The main site, approximately one mile square, is located in Alameda County, California, near the city of Livermore (see Fig. 1), and employs approximately 10,000 people. Site 300, which is used for high explosives testing, occupies an area of approximately 10 square miles, and is located about 15 miles southeast of the main site, near the City of Tracy, in San Joaquin County. References to LLNL in this plan include both sites.

The Laboratory was established in 1952 to carry out nuclear weapons research. Since then, activities have expanded to include research in such basic disciplines as chemistry and materials science, engineering, geology, biology, computer science and technology, and physics. Administratively, these activities are organized into thirteen directorates.

II. RESOURCES

A. Program Budget

In Appendix A, the budget for the Waste Minimization and Pollution Prevention Awareness Program itemizes the funds allocated to the various activities in the program. This information is derived from Activity Data Sheet (ADS) SF-3913, dated March 1993.

Funding to plan and implement waste characterization, process waste assessments and minimization comes from the various programs and is not included in this budget. These expenditures are significant, especially for the programs that are large generators and those that have waste minimization committees. Waste minimization and pollution prevention are not identified in program budgets, but are normally part of the program Environmental, Safety and Health budgets.

It should be noted that DOE-EM plans to implement substantial reductions in waste minimization funding for FY 1994. This will adversely affect the ability of LLNL to carry out the plans described in this document. Additional funds are being sought under the Crosscut Plan, but their availability is unknown now.

B. Personnel

The number of full-time and part-time employees assigned to the Waste Minimization and Pollution Prevention Awareness Project is described in Appendix A. Programmatic Personnel assigned to waste minimization and process waste assessment activities are not shown.

The Waste Minimization Project has three full-time Lab employees: the Project Leader, a Non hazardous Waste Coordinator, and a Waste Minimization Engineer. There are also two full-time contract secretarial-clerical personnel, a database manager, and several par-time personnel who are available as needed.

III. POLICY

A. Statement of Management Support/Commitment

The Director of the Laboratory, the Associate Directors, and the Chairman of the Environment, Safety and Health (ES&H) Council, are totally committed to minimizing the generation of waste through source reduction, material substitution, and environmentally sound recycling. Top management will provide resources and the required awareness and/or training on a continuing basis to ensure that the objectives of the Waste Minimization and Pollution Prevention Awareness Program are met.

B. Policy Statement

DOE policy regarding waste minimization specifically is summarized in the following Mission Statement:

> "To develop, promote, and implement cost-effective waste minimization technologies, practices, and policies, in conjunction with partners in government and industry; to conduct the Department's operations in a legally and regulatorily compliant and environmentally sound manner through reducing pollution; and to improve the economic competitiveness, energy security, and environmental quality of the Nation."

On February 27, 1989, John Nuckolls, the Laboratory Director issued the following policy statement regarding waste minimization at LLNL:

> "It is important that the Laboratory make a strong commitment to waste minimization—particularly to hazardous and radioactive waste minimization. Our goal is to reduce the Laboratory's hazardous/ radioactive waste streams by a major factor in the next three to five years by reducing generation and increasing recycling. We will implement an incentive system where each Laboratory program will pay the costs associated with the handling and disposal of its waste. Each program will establish waste minimization goals

and develop plans and assign responsibility for achieving these goals. Waste minimization will be incorporated in the design of new projects."

Subsequently, almost every directorate within LLNL has issued a formal policy supporting waste minimization.

C. Relevant Site Directives or Guidance

The following LLNL documents govern the implementation of this plan and provide additional guidance:

M-078-92	"Hazardous Waste Management Quality Assurance Plan"
M-010	"LLNL Health And Safety Manual"
	"LLNL Environmental Protection Handbook"

IV. OBJECTIVES, STRATEGY, AND GOALS

A. Program Objectives

The primary objective of the Waste Minimization and Pollution Prevention Awareness Program is to cause a significant reduction in the generation of radioactive, hazardous, and mixed wastes, and also nonhazardous solid wastes. It is also the objective of the Program to instill an attitude of pollution prevention into the day-to-day activities of the personnel at LLNL.

B. Strategy

The waste minimization program at LLNL places responsibility for waste minimization on the generators and the generator organizations. Essential elements of the strategy are: (1) an organization that comprises line and staff representatives who administer the waste minimization program within the programs, (2) a process that identifies targets for waste reduction, and (3) a method for tracking the performance and progress of the program. The strategy involves the distribution of responsibilities for providing support, planning, and implementing waste minimization measures. The strategy thus establishes the roles for the Waste Minimization Program Office (WMPO) and that of the LLNL Waste Minimization Steering Committee (WMSC). This is described in detail in Section V of this report.

The strategy for achieving the Laboratory objectives will make use of, but will not be limited to, the following activities:

- Foster a philosophy to conserve resources and minimize waste generation and pollution in achieving programmatic objectives.
- Promote the use of nonhazardous materials in operations to minimize the potential risks to human health and the environment.
- Reduce or eliminate the generation of waste materials through input substitution, product reformulation, process modification, improved housekeeping, and onsite closed-loop recycling to achieve minimal adverse effects on the air, water, and land.
- Enhance communication of waste minimization objectives, goals, and ideas laterally and vertically among site organizations.
- Promote integration and coordination of waste generators and waste managers on waste minimization matters.
- Characterize waste streams and develop a baseline of waste generation data.
- Identify and implement methods and technologies for waste minimization.
- Target policies, procedures, or practices that may be barriers to waste minimization.
- Create incentives for pollution prevention.
- Develop and implement employee pollution prevention awareness and occupational training programs.
- Collect and exchange waste minimization information through technology transfer, outreach, and educational networks.
- Develop mechanisms for fully disseminating current technical information to site users.
- Enhance employee awareness of pollution prevention goals, objectives, and methods.
- Develop specific goals and schedules for waste minimization activities.
- Comply with federal and state regulations and DOE requirements for waste minimization.

C. Goals

Programmatic pollution prevention goals are described in the attachments to this Plan. LLNL has committed to implementing certain waste minimization options, as described in the *Source-Reduction Evaluation Review and Plan* reports that it published in 1991. The Programs will proceed with implementing these, supported by the WMPO as needed. Additional Lab-wide goals established for the coming year are listed below:

- **Employ alternative cleaners**

  A wide variety of hazardous solvents are used throughout LLNL in an even wider variety of cleaning applications. These include chlorinated solvents, CFCs, hydrocarbons and other volatile organic compounds. Many of these not only become hazardous or mixed wastes, but also cause costly air permit issues. CFCs, of course, must be eliminated by 1995. Thus, although solvents were not among the largest waste streams in 1990, and were therefore not addressed by the SB14 report, their replacement is still a high priority objective for practically every program. A project to test non- or less-hazardous alternatives was initiated late in 1991 and is expected to continue until the end of FY 1993.

- **Reduce use of priority chemicals**

  The Secretary of Energy has directed that each DOE facility shall evaluate the feasibility of reducing the use and release of the 17 "priority chemicals" covered by the EPA 33/50 program (Watkins, 1992). These chemicals are listed in the table below

Priority Chemicals Covered by EPA 33/50 Program

Benzene	Methyl Ethyl Ketone
Cadmium and compounds	Methyl Isobutyl Ketone
Carbon Tetrachloride	Nickel and compounds
Chloroform	Tetrachloroethylene
Chromium and compounds	Toluene
Cyanide compounds	1,1,1 Trichloroethane (TCA)
Dichloromethane[2]	Trichloroethylene
Lead and compounds	Xylenes
Mercury and compounds	

DOE has committed to a 50 percent reduction by 1995 (based on 1988 data) in releases of these chemicals from DOE facilities that currently submit TRI Form R reports. Facilities that do not now submit TRI Form R should achieve a 33 percent reduction, and initiate voluntary reporting in 1993 of all TRI chemicals meeting threshold levels. The second category applies to LLNL. The final draft of the DOE guidance document links participation in the 33/50 program with the threshold quantities of the TRI report. DOE facilities that do not meet the threshold usage will not participate in the 33/50 program (DOE, 1992).

- **Recycle spent oil**

  Large quantities of spent lubricating oil have been managed as hazardous wastes and sent to be burned for energy recovery. Both Federal and California regulations

[2] Also known as methylene chloride.

allow such oil to be hauled to an offsite re-refiner, who will reprocess the oil for reuse. Not only is this environmentally preferable, according to EPA and DTSC, but the less stringent regulations for recycled oil should reduce waste management costs. Plans to implement this recycling operation are being developed. Recyclable oils are primarily generated by Business Operations (vehicle maintenance) and Plant Engineering.

- **Recycle batteries**

  Lead-acid batteries from vehicle maintenance have been sent to offsite recyclers by LLNL for many years, but all other types of used batteries are either thrown in the general trash or managed as hazardous wastes. The WMPO is investigating options for reducing the quantities (e.g. with rechargeable batteries) and for recycling the rest of the spent batteries. A pilot program began during 1992 within EPD to replace disposable pager batteries with rechargeable batteries.

- **Expand recycling of white paper and cardboard**

  On April 30, 1992, the Director of LLNL placed a hold on the White Paper Recycle Program based on concerns raised during a briefing which took place on the same date. During the month of May, the EPD Solid Waste Coordinator recommended three options to LLNL management, procured funding and implemented these options to reinstate the White Paper Recycle Program.

  During the third week of May, the contract was put in place to begin implementing the Cardboard Recycle Pilot Program. The Solid Waste Coordinator is working with Plant Engineering to design the required "collection bins" and with TID to develop posters advertising the pilot program within the ten pilot buildings.

- **Investigate microscale chemistry labs**

  Microscale chemistry labs are rapidly gaining acceptance in the academic community because they can reduce waste generation by one or two orders of magnitude. Several programs (e. g. Chemistry & Materials Science and Lasers) have expressed interest in the applicability of this technique for research experiments.

- **Employ transportable treatment units**

  The SB14 report identified contaminated wastewater as the largest category of hazardous waste generated by either the Main Site or Site 300. Currently, such wastewater is captured in retention tanks located at the generating building. If analyses show that the water cannot be sent to the POTW, then it must be hauled to a licensed offsite facility for treatment. Programs have already taken significant steps to reduce the quantity of water, but cannot eliminate it. Although treatment is not a waste minimization technique, using a transportable treatment unit (TTU) could greatly reduce waste management costs. This has been tested at one Main

Site building. The WMPO plans to expand the contract in 1993, so that this service can be used wherever economically feasible.

- **Recycle hazardous rags**

  LLNL generates an estimated 5,000 pounds per year of rags and paper towels that are contaminated with hazardous materials (primarily nonpetroleum solvents). These are currently sent to a hazardous waste incinerator, mixed with other hazardous materials. Rags contaminated with oil and other petroleum-based material already go to an offsite recycler that is not permitted to handle chlorinated solvents. The WMPO is evaluating the feasibility of recycling these rags.

- **Recycle construction demolition wood**

  Plant Engineering now has a contract in place to allow a vendor to obtain construction demolition wood for recycling. This material has previously gone to the nonhazardous landfill.

D. Schedule of Activities

A schedule of waste minimization activities is presented in Appendix D.

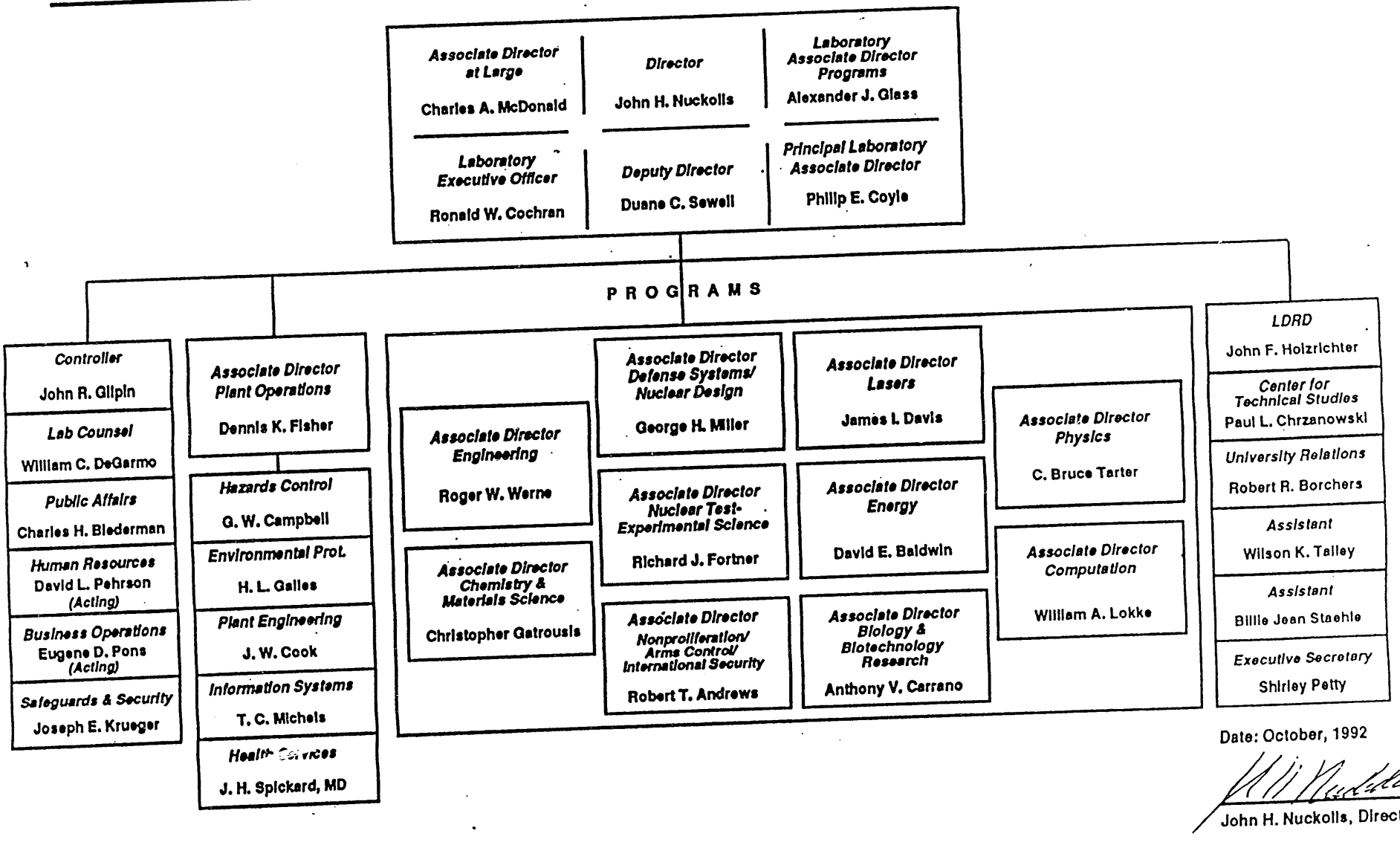
V. ORGANIZATION AND STAFF RESPONSIBILITIES

A. Description of the Waste Minimization Organization

Lawrence Livermore National Laboratory is managed through the organizational structure shown in Fig. 1. The chart includes the following organizational changes that were announced in 1992:

- Environmental Research transferred to the Physics Directorate, and the former Biomedical & Environmental Research Directorate was renamed Biology and Biotechnology Research
- The management of the Plutonium and Tritium facilities was transferred from the Chemistry & Materials Science Directorate to the Defense/Nuclear Design Directorate.
- The management of the Hardened Test Facility was transferred from the Military Applications Directorate to the Defense/Nuclear Design Directorate.
- Special Projects Directorate was renamed Nonproliferation/Arms Control/ International Security Directorate.
- Earth Sciences transferred to the Physics Directorate.

Lawrence Livermore National Laboratory



Date: October, 1992

John H. Nuckolls, Director

Figure 1. LLNL Organization Chart

- Energy Programs transferred to the Magnetic Fusion Directorate, which as renamed Energy Directorate.
- The Military Applications Directorate was eliminated and its functions became part of the Defense/Nuclear Design Directorate.

Responsibilities for ES&H and the programmatic activities of the Laboratory start with the Director and are delegated to Associate Directors and Program Leaders. Included in these responsibilities are pollution prevention and the implementation of waste minimization.

The Waste Minimization Project Office (WMPO) is part of the Operations and Regulatory Affairs Division of the Environmental Protection Department within the Plant Operations Directorate. This office is charged with providing coordination, guidance, cost and wastes accounting. In addition, it monitors the progress of the program, technology transfer, and technical support for the LLNL waste minimization effort. The WMPO is also responsible for establishing a pollution prevention awareness program and providing guidance to ensure that LLNL is in compliance with federal and state regulations associated with pollution prevention. The WMPO interacts Lab-wide via the Waste Minimization Steering Committee (WMSC) and through contacts with the individual program waste minimization committees and coordinators. The office also interacts directly with generators to help carry out assessments, assist in evaluating technical and economic feasibility studies, and facilitate technology transfer.

The program's organizational structure is designed to maximize the dissemination and collection of waste minimization information, and to provide waste generating organizations with managerial responsibility for the development, design, construction, and implementation of waste minimization projects.

B. Waste Minimization Steering Committee (WMSC)

The WMSC, which is chaired by the Head of the Environmental Protection Department, is composed of senior management representatives from each of the Directorates and Programs. The WMSC develops and recommends waste minimization policies at LLNL. The WMPO Project Leader also serves as the Secretary of the WMSC.

Other functions of the WMSC include but are not limited to the identification of tasks to implement the program, providing a mechanism for communication within the site on waste minimization matters, and reviewing policy changes and the implementation of lab-wide waste minimization projects.

The responsibilities of the WMSC members include:

- Supporting the organizational maintenance of the waste minimization program (in accordance with DOE Order 5400.1)

- Communicating waste minimization and pollution prevention objectives to the Directorates and Programs
- Obtaining waste generator support and input for the program
- Facilitating integration and coordinated interaction with waste generators
- Sponsoring ongoing employee awareness and training
- Coordinating participation of his/her organization with the WMPO
- Recommending options for management implementation
- Monitoring the progress of the waste minimization program
- Facilitating technology transfer and pollution prevention awareness

C. Waste Minimization Coordinators

Directorates that are large generators of hazardous wastes have waste minimization coordinators and/or waste minimization committees. The committees are made up of mid-level managers and/or technical staff. The responsibilities of the committees and coordinators include the documentation of hazardous materials usage, waste streams and generating processes; taking part in carrying out process waste assessments; identifying targets of opportunity; and facilitating the implementation of waste minimization measures.

During 1992, all of the directorates that conduct operations at Site 300 signed a Memorandum of Understanding that designated the Defense/Nuclear Design Directorate as the lead organization for waste minimization activities at this site.

VI. COST ACCOUNTING

Average costs associated with the transportation and disposal of many types of wastes have been estimated by HWM. These estimates are calculated in terms of unit mass or volume of waste. This information will be used in process waste assessments for economic analyses of waste minimization options.

Presently, the overhead costs of hazardous waste management are not allocated to specific waste streams or types of wastes. Hence, they have not been used in evaluating pollution prevention options. These are expected to be even larger than the direct disposal costs. The WMPO plans to work with HWM to analyze these cost data and develop cost estimating factors that will give a more realistic value of potential savings.

Program costs that are directly related to waste management and/or waste minimization are not segregated. Lasers program has initiated an analysis of its

hazardous waste management costs, and this work is expected to serve as a model for other programs.

VII. WASTE ASSESSMENTS

Process waste assessments (PWA) are conducted as part of an ongoing program to identify, screen, and analyze options to reduce the generation of waste. A PWA determines the amount of material in a workplace that is disposed of as waste. It provides a summary of hazardous materials usage and waste production and identifies those processes and operations that need to be improved or replaced to promote waste minimization. The assessment also provides a basis for prioritizing specific waste minimization options.

The hazardous waste generating activities at LLNL can be compared to those in a small industrial park with a multitude of small generators and a few larger generators. In such a situation, facility process flow diagrams can not be easily prepared. In the past, large aggregate waste streams have been identified and analyzed for waste minimization potential (see Bibliography). Future activity will focus on the identification of waste streams that account for 5% or more (by mass) of the total lab-wide hazardous waste generation in calendar year 1990. This criterion complies with the requirements of the California Hazardous Waste Management and Source Reduction Act. Detailed process description and requirements, waste management activities, and process flow diagrams will be documented where possible for the identified processes.

Assessments of waste generating operations within the programs are an ongoing activity conducted by waste assessment teams organized by the line management of the respective organizations. Some directorates have established a policy of annually re-assessing any waste stream that cannot be completely eliminated. However, some discretion must be used for very small streams, where potential cost savings may not offset the cost of the assessment.

Waste minimization opportunities are evaluated within each organization. The evaluation results will lead to a list of options that are candidates for technical and economic evaluation. The potential technical success and economic cost/benefit of identified options are evaluated by the organizations. The options will then be ranked in order of preferred implementation. The highest priority normally will be given to source reduction followed by recycling. A Waste Reduction Activity Report (under DOE Order 5820.2a) has been prepared for CY1991, and includes listings of implementations done in CY1991.

VIII. WASTE MINIMIZATION TECHNIQUES

A. Scope

Waste minimization includes those activities that minimize or eliminate the generation of waste (source reduction) and recycling processes that use, reuse, or reclaim a material from a waste stream. Some activities commonly thought to be waste minimization are waste treatment. The following activities are not considered waste minimization:

- Transfer of hazardous constituents from one environmental medium to another
- Concentration conducted solely for reducing volume
- Dilution as a means of toxicity reduction, unless later recycling steps are involved

If the activity is to make the material more amenable for disposal (e.g., reduce volume or toxicity before storage or disposal) then the waste is being treated, not minimized.

B. Techniques

1. Inventory Management

Current methods to control the types and quantities of materials in the site inventory will be reviewed. Where necessary, inventory control techniques will be revised or expanded to reduce inventory size and hazardous chemical use while increasing inventory turnover. In particular, inventory control techniques will be used to reduce waste resulting from excess, out-of-date, and no-longer-used raw materials. Control techniques will also be developed to discourage the use of extremely hazardous materials and encourage the use of more easily manageable materials.

The review of inventory management techniques will include a study of how existing inventory management procedures can be applied more effectively, whether new techniques should be added to or substituted for current procedures, the need for review and evaluation approval procedures for the purchase of materials, and the need for additional employee awareness and/or training.

The Nuclear Design Directorate established an informal system for utilizing surplus chemicals at Site 300. This enabled programs possessing surplus (often unopened) chemicals to offer them to another program. This system has now been implemented at the Main Site under the sponsorship of Nuclear Design, Chemistry & Materials Sciences and Lasers Directorates. It is planned to expand this to all potential users during 1992.

2. Maintenance Program

Waste streams generated within the site maintenance program have been identified and techniques leading to waste reduction have been implemented in certain areas with considerable success. The maintenance program is committed to seeking ways to use new technologies to reduce waste.

The site equipment preventive maintenance program for vacuum pumps and air conditioning equipment has been reviewed to determine whether improvements in corrective and preventive maintenance can reduce waste generation caused by equipment failure.

3. Material Change and Process Equipment Modification

The replacement, reformulation, reduction, or elimination of hazardous materials in production, maintenance, and cleaning processes is being examined. The effect on waste reduction by the installation of new equipment or the modification of existing equipment has been considered in several areas. Techniques such as segregation to separate hazardous wastes from the total waste stream are an accepted Laboratory practice. New applications are continually being explored. Those applications offering significant waste reduction or cost benefit will be implemented as funding allows.

4. Recycling and Reuse

Opportunities for reclamation and reuse of waste materials has been explored and is being practiced whenever practical. Decontamination of tools, equipment, and materials for reuse or recycle has been ongoing for a number of years. LLNL will look for other opportunities where recycling and reuse may be found practicable to minimize the amount of waste for disposal.

Reclamation of nonhazardous scrap metals (ferrous and nonferrous), cardboard, tires, and most recently white paper has proven successful at LLNL. The white paper recycling activity was interrupted briefly during 1992 because of security concerns, but these have been resolved and the activity has resumed. The pilot program for recycling cardboard is currently expanding to include more buildings.

Recycling of hazardous materials is more difficult because of regulatory permit requirements. Generally, a hard-piped recycling system that returns material directly to the generating process for reuse does not require a permit. Onsite recycling systems that are not integral to the generating process must have a permit from DTSC. Permitting is a very expensive and time-consuming procedure that is not justified for relatively small waste streams.

5. Eliminate Waste Generating Activities

It is quite acceptable, under the requirements of either SB14 or the PPA, for one business to shift waste generating processes to another, thereby eliminating the associated waste streams. For example, the LLNL Plating Shop ceased chromium plating in 1989. Onsite programs that require chrome-plated parts are now referred to commercial plating shops in the Bay Area. Plant Engineering, a division of Plant Operations Directorate, ceased onsite regeneration of the ion exchange resin beds that provide deionized water for the Laboratory. Now, the resin vendor takes spent resin to its shop for regeneration and provides fresh resin periodically. This eliminates the need for LLNL to dispose of a large amount of metal-contaminated water (which is classified as a hazardous waste) from the regenerating process. In 1990, LLNL disposed of 173,000 kilograms (~381,000 pounds) of this water, compared to none in 1991.

Some people argue that simply shifting operations in this way does not really minimize or eliminate waste, since the demands for chrome plating or for deionized water are not necessarily reduced. Businesses that specialize in the operation may be better able to employ other waste minimization strategies, for either financial or technological reasons, but there is no way to assure that this is the case. The resin vendor reclaims metals from the dilute regeneration solution and resells these to metal recyclers. Commercial chrome platers typically pretreat their effluents to convert hexavalent chromium (highly soluble and a carcinogen) to less hazardous trivalent chromium that can be removed easily from wastewater.

IX. TRAINING, AWARENESS, AND INCENTIVES

A. Training Goals

One of the most important elements of a waste minimization program is training. Goals of the training program are to: 1) make each employee aware of waste generation,
2) have employees understand the impact of wastes on the site and the environment, and 3) to provide information on ways (including technologies) to reduce waste and prevent pollution.

The HAZWRAP Pollution Prevention Workshop was presented at LLNL in May 1992. This workshop was open to all LLNL staff, as well as representatives from other DOE facilities in the Bay Area (Lawrence Berkeley Laboratory, Sandia National Laboratory - Livermore, Stanford Linear Accelerator, etc.).

B. Specialized Training Program

A multilayer training program is being developed. At the management level, employees will be instructed on policy and procedures as well as techniques for encouraging and fostering pollution prevention within their immediate groups. Key individuals identified by their line management will be given specialized, intensive training on waste minimization methods, tools, and sources of information. Other generators will receive generalized training on policy and procedures, waste minimization methods and techniques, environmental awareness, and sources of help and information.

Specialized Process Waste Assessment (PWA) workshops, prepared for DOE by INEL personnel, were held at LBL during September 1992. A half-day session familiarized managers with the need and general requirements for PWAs. A full-day session gave first-line staff detailed experience in preparing PWAs.

C. Pollution Prevention Awareness

The Pollution Prevention Awareness Program required by DOE Order 5400.1 has been incorporated into the Waste Minimization Program. The purpose of the Pollution Prevention Awareness Program is to encourage the philosophy that prevention is necessary and should be a part of our routine daily activities. The goal of the program is to incorporate pollution prevention into the decision-making process at every level throughout the organization. The Pollution Prevention Awareness Program has the following objectives:

- Make employees aware of general environmental activities at the Lab and waste minimization program requirements, goals, and accomplishments
- Inform employees of specific environmental issues
- Inform employees on their responsibilities in pollution prevention
- Recognize employees for efforts to improve environmental conditions through pollution prevention
- Encourage employees to participate in pollution prevention
- Publicize success stories

The program consists of three elements: (1) pollution prevention awareness functions, (2) peer recognition, (3) and information exchange.

The pollution prevention awareness functions make extensive use of site newsletters, bulletin boards, signs, and slogans to enhance employee awareness of and participation in pollution prevention. As examples, during 1991-1992:

- A poster session was presented during Earth Week 1992

- Posters have been regularly placed on bulletin boards

The pollution prevention awareness program may also develop an orientation program for new employees. The orientation program would include the following elements:

- The need for, and benefits to be derived from, waste minimization and pollution prevention
- The contribution each employee can make to an improved working and living environment
- Emphasis of management commitment to waste minimization and site waste minimization policy
- Overview of policy and regulations
- Solicitation of waste minimization and pollution prevention ideas

D. Incentive Awards and Recognition

A program to give peer recognition to individuals involved in waste minimization and pollution prevention achievements is carried out through the use of the Lab newspaper—*Newsline*. The potential for developing an awards system for successful projects will be considered at a later time.

X. TRACKING AND REPORTING SYSTEMS

Table 1 lists the reports that LLNL regularly must prepare for various agencies concerning its waste minimization and pollution prevention activities.

Tracking systems developed under this program are being designed to facilitate the reporting of waste minimization data and accomplishments to the Department of Energy, the Environmental Protection Agency, and the California Department of Toxic Substances Control.

A. Computerized Tracking for Hazardous Materials

There will be two computerized systems involved in tracking hazardous materials at LLNL. One, a chemical tracking system, is still under development, and will not be available lab-wide until FY1994. It will track identified hazardous materials from point-of-site entry to the final location of use, and record the quantities of hazardous constituents. The date and location of final consumption will also be recorded. From a

Table 1. Reports Routinely Generated by Waste Minimization Project

Report Name	Frequency	Submitted To	Regulation/ Order	Next Report Due	Information Contained
Waste Minimization Activity Report	Annual	DOE	DOE Order 5400.1	3/1/93	Waste reduction data, measures
Process Waste Assessments	Annual	DOE	DOE Order 5400.1	Not specified	Waste reduction data, measures
Waste Minimization and Pollution Prevention Awareness Plan	Every two years with annual update	DOE	DOE Order 5400.1	5/31/93	Detailed plans and schedules for reducing wastes
Toxic Release Inventory (TRI) Form R	Annual	EPA	Pollution Prevention Act of 1990	7/1/93	Waste reduction data, measures
Phase-out of ODCs	Annual	DOE	Clean Air Act of 1990 and Watkins' memo of 7/29/92	11/15/93	Costs and target dates to complete phase-out
Implementation of EPA 33/50	Annual	DOE	EPCRA and Watkins' memo of 9/22/92	11/30/93	Progress in eliminating 17 priority chemicals
Hazardous Materials Recycling Report	Every two years	Alameda County	California Law AB1475	7/1/94	Non RCRA hazardous materials recycled
Hazardous Waste Management Performance and Source Reduction Evaluation	Every four years with updates as needed, but will change to every other year after 1994	Public document must be available to DTSC on demand	California SB14 Hazardous Waste Source Reduction and Management Review Act of 1989	9/1/95	Waste reduction data & measures; descriptions of processes; economic evaluations and implementation schedules

waste minimization standpoint, this is particularly important for volatile materials (e.g. CFCs and certain other solvents), whose losses during use cannot be accurately measured.

A separate waste tracking system is operated by the Hazardous Waste Management Division of EPD. This system, which has been in service for many years, collects data on the location and date when hazardous, radioactive and mixed wastes are prepared for transfer to a waste accumulation area. It also records the quantity, the waste description, the generator of the waste, the applicable hazardous waste codes, and final disposition of the waste.

The information that can be extracted from each of these systems will allow the Project office to track hazardous materials before they become a waste, and track wastes for monitoring and reporting purposes.

Several laboratory programs have a computer based tracking system that outlines the types of activities going on in their respective areas and indicates where waste minimization implementations have been made.

B. Procurement Control System

The control and purchase of hazardous chemicals or other materials will be reviewed by the Project office to determine what improvements in those procedures can be made to achieve waste minimization goals.

C. Nonhazardous Waste Tracking

The Solid Nonhazardous Waste Coordinator has been working with Plant Engineering personnel to develop a database and to obtain a candidate to be the responsible data entry person. We are currently facilitating an internal/external review of Plant Engineering's database capabilities prior to beginning actual "construction" of the database.

Laborers who make the dump runs are now noting the contents of their loads on the dump tickets. This will assist with data input for the database and may also assist during the Nonhazardous Waste Stream Assessment discussed below.

XI. QUALITY ASSURANCE

Guidance implementing DOE Order 5820.2A stresses quality assurance in conducting waste reduction activities. The order indicates that waste reduction programs are required to "retain an appropriate level of documentation and accountability. The documentation of these programs should be designed to satisfy all requirements of the Waste Operations Quality Assurance Program at each field office."

A. Quality Assurance Program Plan

A Quality Assurance (QA) program plan has been developed for the management of the Waste Minimization Program as required for all programs by DOE Order 5700.6B. The plan will be revised to be consistent with the Waste Operations Quality Assurance Program of DOE-SAN. The plan will specify documentation that will enable verification of data reported in the Hazardous Waste Management database.

B. Quality Assurance Training

Training on QA methods for waste minimization procedures and documentation will be given to appropriate Project office staff members. Other employees will be briefed on policies and procedures.

XII. INFORMATION EXCHANGE AND OUTREACH

Program staff participate in and encourage others to make regular use of the EPA database (PIES) and the DOE Waste Information Network. The Project office encourages participation in business, education, and government forums that are designed to provide technical assistance and exchange waste minimization information. The Secretary of the WMSC selects representatives to attend the semiannual DOE Workshop on Waste Minimization. Appropriate LLNL staff regularly participate or communicate with technology groups and agencies, including:

- California Department of Toxic Substances Control
- Alameda and Contra Costa counties waste management workshops
- Local Government Commissions Pollution Prevention Program
- EPA Office of Research and Development Center for Environmental Research Information.
- Federal Facilities Environmental Roundtable.

The Federal Facilities Environmental Roundtable is an informal group that resulted from the April 1992 EPA Region IX conference in San Francisco. LLNL participates in meetings of this group to discuss common interests in pollution prevention.

LLNL personnel also participate in other outside activities that relate to waste minimization. For example, LLNL provided two speakers for "Hazardous Waste Minimization in Metal Finishing Shops workshops that were sponsored by the County of Santa Clara Office of Toxic & Solid Waste Hazardous Waste Management Program.

These workshops were designed to help small businesses comply with California regulations for hazardous waste minimization.

Personnel from Nuclear Design, Lasers and Engineering published articles in DOE newsletters and professional journals and have presented papers at national and international meetings.

XIII. TECHNOLOGY TRANSFER

The transfer of federally developed technology between laboratories and potential users is a contractual responsibility of DOE facilities and laboratories. Opportunities for transfer of technologies specific to waste minimization programs develop from information exchange systems, workshops, or topical conferences. Direct exchanges of process technology between facilities are encouraged, but institutional support services will be used where appropriate. Technology projects that are identified and implemented shall be coordinated with the Headquarters Office of Technology Development.

XIV. RESEARCH AND DEVELOPMENT

The WMPO has proposed a project that will focus on the development of the following pollution prevention/elimination technologies:

- Mixed waste separation using shear separation and alternative solvent wash techniques
- Nonhazardous laser lens cleaning
- Remote sensing of radioactivity using microwave perturbation methods
- Nonmetallic anti-static packaging of sensitive electronic components

Project Description:

1. **Mixed waste separation**: We will develop several alternative methodologies for separating the hazardous from the radioactive fractions of mixed wastes, focusing on materials with the hazardous fractions composed of solvents and other organics, and the radioactive fractions made up of metal particles, such as from machining operations. The first methodology, using a fluid dynamics approach called shear separation, has already been examined as a means of breaking emulsions and separating suspensions with components differing in viscosity. It can also be used to

separate particulates from liquids. The second method will employ nonhazardous cleaning media in conjunction with filtration techniques to providing a cost-effective, low-energy-requirement approach to mixed waste separation.

2. **Nonhazardous laser lens cleaning**: Methods will be developed for cleaning laser lens components and other high precision parts up to present performance standards using cleaning media that generate no hazardous waste streams and no VOC or CFC air emissions.

3. **Remote sensing of radioactivity**: Using a technique currently being developed in O-division, a sensor for ionizing radiation will be developed that is based on perturbations caused in high intensity microwave signals. The goal for the first year of this project is to demonstrate the concept, and to identify the sensitivity of the technique. It is estimated that such a sensor could detect radioactive emissions at a distance of 200 meters. Applications include detecting radioactive contamination in dump trucks leaving LLNL, radioactive leaks from drums and other containers, and radioactive contamination in shallow groundwater.

4. **Nonmetallic anti-static packaging**: This effort will use a process developed in the polymers group of Massachusetts Institute of Technology (MIT) to deposit an anti-static coating of electrically conductive polymer onto packaging material for sensitive electronics components. Currently, electroless plating techniques using chelated metal baths are employed for anti-static layers on packaging, and these processes generate highly toxic hazardous wastes which could be eliminated using the nonmetallic methods. The aim of this project is to advance the MIT method to the point where it can be commercialized for an industrial-scale process.

XV. PROGRAM EVALUATION

An annual report on the LLNL Waste Minimization and Pollution Prevention Awareness Program will be prepared to document the effectiveness of waste minimization efforts, describe program achievements, and identify new goals. This report is required by DOE.

APPENDIX A. PROGRAM BUDGET

The budget shown here is only for the Waste Minimization Project Office of the Environmental Protection Department. The individual programs and departments at LLNL expend additional operating and capital funds in support of waste minimization activities, including reporting, assessments, implementations, and general project management.

	Budget, $K	
	FY 1993	FY 1994
Program Administration Management	307.0	322.0
Documentation and Reporting	249.0	26.3
Technical Information	145.0	48.0
Waste Minimization Awareness	0.0	0.0
Waste Minimization Incentive Program	0.0	0.0
Waste Minimization Apprenticeship Program	50.0	0.0
Hazardous, Radioactive & Mixed Waste Minimization Activities	465.0	255.0
Nonhazardous Waste Reduction	217.0	0.0
Total Program Budget	1433.0	651.3

APPENDIX B. SCHEDULES FOR PROGRAM ACTIVITIES

ELEMENTS	RESPONSIBILITY	SCHEDULE
Budget		
1. Complete Waste Minimization Program Itemized Budget	WMPO[3]	March 1993
2. Requirements Definition	EPD[4] & WMPO	February 1993
3. Verification and Acceptance of Budget	EPD	March 1993
Employee Achievements and Incentives		
1. Submit Thank You Letters	WMPO	Continuing activity
2. Submit Stories to Newsline	WMPO	Continuing activity
Employee Awareness		
1. Awareness Activities	WMPO	Continuing activity
2. General Environmental Seminars	WMPO	Continuing activity
3. Newsline Articles	WMPO	Continuing activity
4. Division Overview Day	WMPO	April 1993
5. Earth Day Exhibits	WMPO	April 1993
6. Family Day	WMPO	September 1993

[3] Waste Minimization Program Office
[4] Environmental Protection Dept.

ELEMENTS	RESPONSIBILITY	SCHEDULE
Information Exchange		
1. DOE HAZWRAP Workshop	WMPO	Continuing activity
2. DOE Contractor Committees	WMPO	Continuing activity
3. Forum Meetings	WMPO	Continuing activity
4. Participation in Program WM Meetings	WMPO	Continuing activity
Management Support		
1. Assist Programs in Maintaining Management Support	WMPO	Continuing activity
2. LLNL Waste Min. Steering Committee Meetings	WMPO	Continuing activity
Policy and Plans		
1. Update Waste Minimization and Pollution Prevention Awareness Plan	WMPO	June 1995
Procedures and Practices		
1. Review Procurement and Maintenance Practices	Programs	March 1993

ELEMENTS	RESPONSIBILITY	SCHEDULE
Program Evaluation		
1. Develop Program Evaluation Plan and Procedures	WMPO	December 1992
2. Complete Program Evaluation	WMPO	February 1993
3. Complete Report to WMSC	WMPO	October 1993
Quality Assurance		
1. Complete QA Plan	WMPO/EPD	TBD[5]
2. Develop QA Training Module on Waste Minimization	WMPO/EPD	TBD
Reporting		
1. Compilation of Report Data	WMPO	Continuing activity
2. Submittal of Quarterly Report to DOE	WMPO	Continuing activity
3. Distribution of Trends and Data to Program Management	WMPO	Continuing activity
4. Update California SB14 report	WMPO	As needed[6]
5. Submittal of Annual Waste Reduction Activity Report for 1992	WMPO	March 1993
6. Submittal of California AB1475 Report	WMPO	July 1994

[5] To be determined

[6] The next complete SB14 reports are due September 1, 1995. Updates to the 1991 reports are made as needed to reflect changes in schedules for implementation.

ELEMENTS	RESPONSIBILITY	SCHEDULE
Training and Awareness		
1. Determine Training Course Needs	EPD/Programs	Continuing activity
2. Develop Orientation Program	EPD/WMPO	TBD
3. Develop Specialized Training Program.	EPD/WMPO	TBD
4. DOE Pollution Prevention Workshop	EPD/WMPO	Completed May 1992
5. PWA Workshops	EPD/Programs	Completed September 1992
6. Submit Articles to *Newsline* and to DOE Publications	WMPO	Continuing activity
7. Attend TRI and EPA 33/50 Training by DOE	EPD/WMPO	March 1993
Waste Generation Baseline		
1. Compile Data from Solid Nonhazardous Waste Stream Assessments	Programs/WMPO	July-September 1992
2. Develop Nonhazardous Solid Waste Generation Baseline Data	WMPO	September 1992
Technology Transfer		
1. Execute Technology Transfer	WMPO	Continuing activity
2. Visit Facilities & Other Sites	WMPO	Continuing activity

ELEMENTS	RESPONSIBILITY	SCHEDULE
Process Waste Assessments		
1. Identify Targets	Programs	Continuing activity
2. Perform Assessments	Programs	Continuing activity
3. Implement Waste Min. Options	Programs	TBD
Waste Streams Goals		
1. Establish Goals for Radioactive and Mixed Wastes	WMSC	March 1993
2. Establish Goals for Other Wastes	WMSC	March 1993
3. Compare Results vs Goals	WMPO	Continuing activity
4. Recycle Spent Oil	Programs	March 1993
5. Recycle Batteries (all types)	Programs	September 1993
6. Recycle White Paper	Plant Operations	December 1993
7. Recycle Cardboard	Plant Operations	December 1993
8. TTU Contract to Procurement	WMPO	Completed January 1993
9. Investigate Hazardous Rag Recycle	WMPO	Completed September 1992
SB14 Implementation		
1. Install Filter for B222 Retention Tank	C&MS	December 1992
2. Substitute for Electroless Copper in B141 Plating	Engineering	December 1992
3. Install Sensors for Restroom Lights	Plant Operations	September 1993

ELEMENTS	RESPONSIBILITY	SCHEDULE
SB14 Implementation (continued)		
4. Install Wastewater Recycling System at Site 300 Auto Shop	Site 300	1Q FY93
Waste Minimization Database		
1. Project Initiation	WMPO	Completed
2. Requirements Definition	WMPO	Completed
3. Computer System Development	EPD	Completed
4. Verification and Acceptance	WMPO	Completed
5. Download HWM Data Quarterly	WMPO	Continuing activity

APPENDIX C. ABBREVIATIONS AND ACRONYMS

ADS	Activity data sheet
CFC	Chlorofluorocarbon
C&MS	Chemistry and Materials Science
CY	Calendar year
DOE	Department of Energy
DOE-DP	Department of Energy—Defense Programs
DOE-EM	Department of Energy—Environmental Management
DOE-SAN	Department of Energy—San Francisco Office
DTSC	Department of Toxic Substances Control (California)
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERD	Environmental Restoration Department
ES&H	Environmental, Safety and Health
FY	Fiscal year
HAZWRAP	Hazardous Waste Remedial Action Program
HWM	Hazardous Waste Management
INEL	Idaho National Engineering Laboratory
LLNL	Lawrence Livermore National Laboratory
PPA	Pollution Prevention Act
PO	Plant Operations
POTW	Publicly owned treatment works
PWA	Process waste assessment
QA	Quality assurance
RCRA	Resource Conservation and Recovery Act
TBD	To be determined
TID	Technical Information Department
TTU	Transportable treatment unit
WMPO	Waste Minimization Project Office
WMSC	Waste Minimization Steering Committee

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