Title

Environmental Assessment, Construction and Operation of Replacement Hazardous Waste Facility at Lawrence Berkeley Laboratory

Author

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Environmental Assessment

Construction and Operation of Replacement Hazardous Waste Handling Facility at Lawrence Berkeley Laboratory

September 1992

DISCLAIMER

Finding of No Significant Impact for Construction and Operation of Replacement Hazardous Waste Handling Facility Lawrence Berkeley Laboratory Berkeley, California

Agency: U.S. Department of Energy

Action: Finding of No Significant Impact

Summary: The U.S. Department of Energy (DOE) has prepared an environmental assessment (EA), DOE/EA-0423, for the construction and operation of a replacement hazardous waste handling facility (HWHF) and decontamination of the existing HWHF at Lawrence Berkeley Laboratory (LBL), Berkeley, California. The proposed facility would replace several older buildings and cargo containers currently being used for waste handling activities and consolidate the LBL's existing waste handling activities in one location. The nature of the waste handling activities and the waste volume and characteristics would not change as a result of construction of the new facility.

Based on the analysis in the EA, DOE has determined that the proposed action would not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. 4321 et seq. Therefore, an environmental impact statement is not required.

Address and Further Information:

Single copies of the EA and further information about the proposed project are available from:

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Proposed Action: The proposed action is the construction and operation of a replacement HWHF in the life sciences research area at LBL and the decontamination and closure of the existing HWHF. The HWHF would be housed in a new structure, with paved and landscaped areas, an access road and utilities. Decommissioning activities would include clean closure of Building 75A; removal and disposal of waste stored in Buildings 69 and 75 and decontamination of the buildings in accordance with DOE Order 5400.5; and removal of stored wastes from a 2,000 gallon storage tank and an exterior yard area. Soil and groundwater samples would be taken and remedial action taken, if necessary, in accordance with U.S. Environmental Protection Agency and California Environmental Protection Agency requirements.

Alternatives: The alternatives considered are: no action, remodeling the existing HWHF, and locating the replacement HWHF at alternative sites on and off LBL property. The no action alternative would not meet the desired objective of relocating hazardous waste handling activities to a facility with enhanced safety features in a less congested area.

Remodeling the existing HWHF to the specifications of the proposed replacement HWHF would require an extensive period of reconstruction and would not meet the objective of locating the HWHF in a less congested area. In addition, impacts would result from construction of a temporary facility that would be needed during the remodeling of the existing HWHF.

The Blackberry Canyon parking lot would be the best alternative site within the LBL property. The site is geologically and seismically inferior to the preferred site and its loss as a parking lot would exacerbate present parking problems at LBL.

An off-site HWHF for LBL would conflict with California Guidelines for Hazardous Waste Management Plans (HWMP) and Alameda County's HWMP which state that on-site hazardous waste management is preferable to off-site management.

Environmental Impacts: (1) Land use and planning. Relocation of the HWHF in the Life Sciences area of LBL would be consistent with

LBL's Long Range Site Development Plan and the land use plans of surrounding jurisdictions.

(2) Cultural and Historic resources. No known cultural or historic resources are located in the vicinity of the project. If unknown cultural or historic resources are discovered during construction, the State Historic Preservation Officer would be notified and an archeologist would be retained to evaluate the resources.

(3) Visual Impacts. The new HWHF would be designed to blend with the surrounding terrain and screened from view, to the extent possible, with landscaping.

(4) Vegetation and wildlife. Existing vegetation would be removed during construction of the HWHF, but the area around the HWHF would be revegetated after construction. The action would not impact any threatened or endangered species or other species of concern.

(5) Geology, Soils and Seismicity. The proposed action would require grading of the construction site. Slopes would be stabilized by using retaining walls, where required, and disturbed areas would be revegetated, preventing erosion. The HWHF would be designed to withstand the maximum credible earthquake.

(6) Hydrology and Water Quality. The drainage system near the HWHF site is adequate to handle the increased flow of water from

impermeable surfaces associated with the HWHF.

(7) Air Quality. Dust emissions during construction would be minimized by wetting the soil. Air emissions from the HWHF would be filtered and monitored to assure emissions do not exceed those allowed by permit.

(8) Traffic and Circulation. Relocation of the HWHF would involve construction of an access road and would move traffic associated with HWHF operations to a less congested part of the LBL site. Construction vehicles would create a short-term increase in traffic and demand for parking.

(9) Noise. Noise levels in the area would increase temporarily due to construction noise and permanently due to traffic and exhaust fan noise. Noise increases would be suppressed to the extent feasible.

(10) Utilities and Services. The impact on utilities and services is expected to be slight. The HWHF would conform to the fire protection criteria of DOE Order 5480.7 and would be located about 3 minutes from the LBL Fire Department. Clearing of vegetation, and construction of an access road (acting as a firebreak), would further minimize the risk of fire from the dense vegetation in the vicinity of the proposed HWHF.

(11) Hazardous materials. The HWHF is designed with sloped floors

and sumps to contain potential hazardous waste spills and prevent mixing of incompatible wastes. Training programs and regular audits would minimize the possibility of a radioactive or hazardous waste spill, and emergency procedures would ensure prompt response if a spill occurs. Analysis indicates that reasonably foreseeable accidental radioactive waste spills could result in maximum radiation doses to workers in the immediate vicinity that are well below applicable occupational health protection limits, and accidental hazardous waste spills could require evacuation of areas within 100 meters of the spill to prevent adverse health effects. None of the accidents is expected to have any appreciable impact on the public.

(12) Decommissioning Impacts. The existing HWHF complex would be decommissioned and closed according to a State of California approved closure plan. An underground oil storage tank would be closed and removed. Closure would include: removal and recycling or disposal of waste oils and solvents by a licensed vendor; removal of the oil tank from the ground and transport to a licensed facility for cleaning and recycling or disposal; sampling of the soil beneath the tank to determine whether the tank has leaked, and if necessary, appropriate corrective action.

Building 75A would be closed in accordance with RCRA clean closure requirements. Two waste handling laboratories in Building 75 would be vacated and their contents disposed of or removed to the replacement HWHF. Buildings 75 and 69 and the waste oil tank and outdoor waste storage areas would be decontaminated in accordance with applicable DOE orders and the State-approved closure plan and released for future uses.

(13) Cumulative Impacts. Planned construction in the vicinity of the HWHF could lead to short-term construction-related air quality and traffic impacts. The long term change in land use in the vicinity would be consistent with the LBL Long Range Site Development Plan.

Determination: The proposed construction and operation of a replacement hazardous waste handling facility and the decommissioning of the existing hazardous waste handling facility do not constitute a major Federal action significantly affecting the human environment within the meaning NEPA. This finding is based on information and analyses in the environmental assessment for the proposed action. An environmental impact statement is not required for this proposed action.

Issued at Washington, D.C. this 20th day of October, 1992.

for Paul L. Ziemer, Ph.D.
Assistant Secretary
Environment, Safety and Health

UNIVERSITY OF CALIFORNIA
LAWRENCE BERKELEY LABORATORY

ENVIRONMENTAL ASSESSMENT
Construction and Operation of Replacement Hazardous Waste Handling Facility
Lawrence Berkeley Laboratory

U. S. Department of Energy
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September 1992

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1. INTRODUCTION

The proposed action is the construction and operation of a replacement Hazardous Waste Handling Facility (HWHF) on the Lawrence Berkeley Laboratory (LBL) site. The action would include the construction of an approximately 12,000 square-foot building to house facility operations; site work for locating an 800 square-foot covered storage area for flammable liquid drums and four smaller prefabricated storage shelters; parking and service areas adjacent to the proposed structure; utilities provisions; landscaping; a new access road; closure of the existing LBL HWHF; and transfer of existing operations to the new facility. This environmental assessment (EA) has been prepared for the proposed replacement HWHF at LBL.

LBL is an independent organizational unit of the University of California system operated by the University of California for the United States Department of Energy (DOE). LBL is a leading institution in the field of applied and basic scientific research focusing on technological innovation in energy sciences, general science, and the life sciences.

1.1 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

This EA is prepared in accordance with the provisions of the National Environmental Policy Act (NEPA). The purpose of this assessment is to:

- Provide an interdisciplinary analysis of the environmental impacts of the proposed action in order to determine whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact and help assess alternatives and measures for lessening or avoiding possible adverse impacts.

- Comply with Council on Environmental Quality Regulations 40 CFR Part 1500-1508; DOE NEPA regulations, 10 CFR Part 1021; and DOE Order 5440.1D.

1.2 ENVIRONMENTAL ASSESSMENT ORGANIZATION

The content of the EA is organized to provide readers with a description of the proposed project and to enable review of the environmental issues involved in project development. The following summarizes the format of the report:

Chapter 1, Introduction, discusses the purpose and organization of the EA. A discussion of the purpose of the proposed action is also provided in this chapter.

The location of the proposed action and its objectives are given in Chapter 2, Description of the Proposed Action. This chapter describes the design of the HWHF, and includes discussion of the phases of development (i.e., closure of the existing facility and construction and operation of the replacement HWHF). Regulatory requirements affecting the action are also discussed.

Chapter 3, Environmental Effects Summary and Alternatives Analysis, provides an overview of the project and its potential environmental effects. The summary table contained in this chapter lists environmental effects and measures that have been identified to lessen or avoid potential adverse impacts. Three alternatives to the action and their environmental effects are then considered. The alternatives are: 1) No Action Alternative, 2) Remodel Existing HWHF, and 3) Alternative Site Location.

Assessment of the action's potential effects on the environment is contained in Chapter 4, Environmental Issues. Each section in this chapter is organized in two subsections: first, a description of the environmental setting; and second, an analysis of the probable impacts of the proposed action with a discussion of measures designed to lessen potential adverse effects. Cumulative impacts and unavoidable adverse impacts are examined in the last two sections of this chapter.

Chapter 5, Contributors to the Environmental Assessment, lists the authors of the environmental document. Agencies and persons consulted in the document's preparation are also provided in Chapter 5. Chapter 6, References and Abbreviations, indicates the reports and documents involved in preparation of the EA, as well as definitions of symbols and acronyms used.

The appendices for the document include the geotechnical investigation prepared for the proposed replacement HWHF; a review of records and documents conducted for the action; the technical references for endnotes included in the document; a discussion of acoustic fundamentals; and the results of the biological assessment prepared for the action and a letter from the U.S. Fish and Wildlife Service regarding the proposed action.

1.3 PURPOSE AND NEED OF THE PROPOSED ACTION

The replacement HWHF is needed for several reasons:

- The existing facility is located in a congested area, next to an LBL transportation center which is subject to high vehicle traffic. This poses an increased risk for an accident involving hazardous or radioactive waste and increases the potential exposure to personnel and the environment.
- The existing facility utilizes several older buildings and cargo containers. Due to space constraints and to stricter requirements, current operations are inefficient.
- The existing facility was built according to earlier codes which did not require the safety and environmental features required today for the safe handling of hazardous and radioactive waste.

The proposed action would consolidate LBL's waste handling functions into a new, specially designed facility with improved safety containment features and additional work space. It would replace the existing HWHF which utilizes several older buildings and cargo containers. The action would be designed to: reduce traffic congestion on the LBL site by moving HWHF activities from the congested Shop and Support Facilities Area to the Life Sciences Research Area; create greater overall efficiency for LBL site operations by creating areas for planned development in accordance with the LBL Long Range Development Plan (LRDP, 1987); and enhance environmental safety by providing improved conditions and facilities for the handling of hazardous waste.

The proposed action would be designed so that the replacement HWHF could accommodate the waste stream that is envisioned over the next ten years and beyond, as described and analyzed in the 1987 LBL LRDP EIR. Waste minimization plans call for reducing the amounts of hazardous materials used in existing and new research programs that would need to be disposed of by a combination of in-house recycling and reduction of the quantities of hazardous chemicals ordered by LBL researchers. These minimization plans are projected to either maintain wastes at their current levels or reduce the levels in some cases.

The existing HWHF, located near the center of the LBL site, would be closed after the start of operations at the replacement facility. The replacement facility would relocate existing hazardous waste handling operations from a congested central area containing a large number of LBL employees to a less utilized portion of the LBL site. The proposed facility would not increase the volume of hazardous waste handled at LBL. Construction of a replacement facility would allow for more efficient and orderly operation of the LBL site and hazardous waste operations.

The proposed action would make available space in the central area of LBL currently devoted to waste handling activities. The LRDP for LBL proposes to locate a central supply storage and office building on the present HWHF site. This would consolidate certain administrative functions currently spread out across the laboratory in temporary trailers and 50-year-old wood frame structures. These uses would provide greater compatibility among buildings at the present HWHF location, and would improve traffic flow, as discussed in the LBL LRDP. The environmental impacts of these and other future proposed activities would be assessed in appropriate environmental review processes.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 LOCATION

The LBL site is situated on the western slope of the Berkeley Hills overlooking the University of California, Berkeley, the City of Berkeley, and the San Francisco Bay (Figure 2-1). It occupies land within the City of Berkeley and the City of Oakland. Both the existing HWHF and the site of the replacement HWHF lie within the City of Oakland (Figure 2-2). For the purposes of this EA, "the proposed site" or "the site" refers to the area directly affected by this replacement facility development (i.e., the approximately three-acre area within the fence line that includes the limit of grading and improvements for the action). The existing facility area is not included in "the proposed site," as defined.

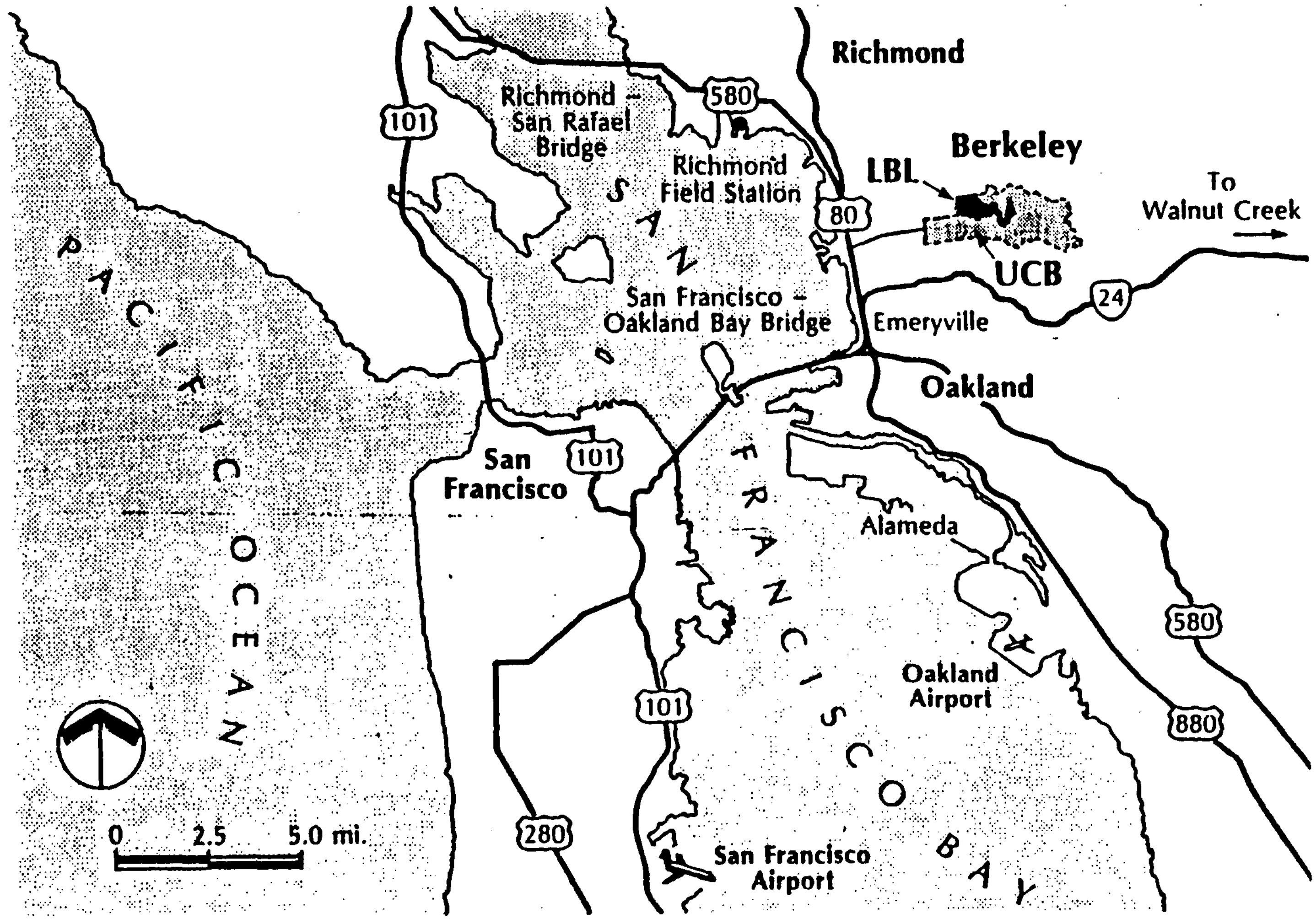
The proposed replacement HWHF would be located in the eastern portion of LBL, east of Centennial Drive. The site is in the upper drainage basin of the Strawberry Creek watershed and is bounded on the east and on the west by steep hillsides and ravines. South- and west-facing slopes form a backdrop to existing development adjacent to the site. This existing development consists of two buildings, one and two stories high, containing biomedical facilities.

2.2 CHARACTERISTICS

The proposed action would develop about three acres of land in the approximately 13-acre Life Sciences Research Area of the LBL site. New structures, paved and landscaped areas, utilities provisions, and an access road would form part of the facility. Excavation, fill, and grading activities would be required to prepare level building areas and provide proper grading for the access road as well as to accommodate site drainage. The action would be designed to balance cut and fill operations to the extent feasible with good construction practice to minimize the need to import or export soil materials.

REGIONAL LOCATION MAP

FIGURE 2-1



SOURCE: LBL LONG RANGE DEVELOPMENT PLAN (AUGUST 1987)

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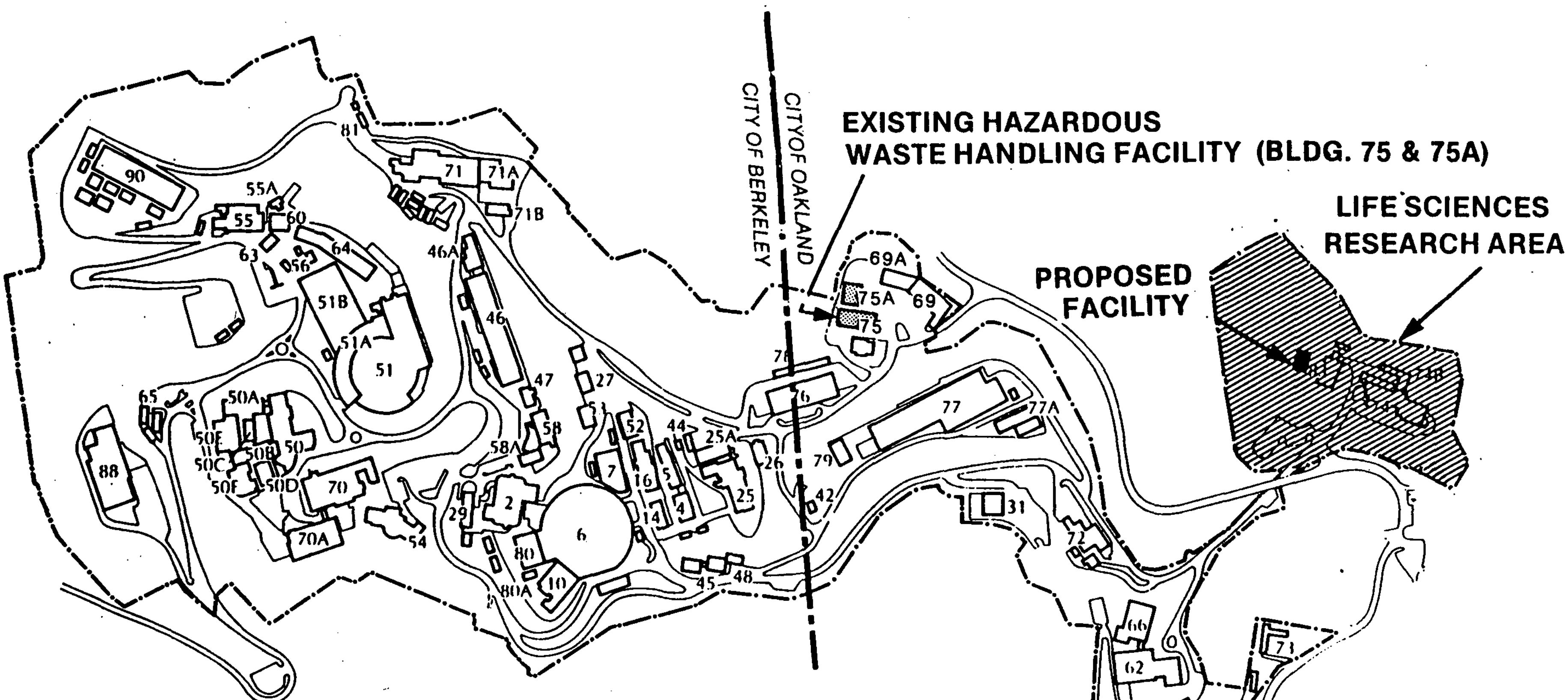
SITE LOCATION MAP

FIGURE 2-2



SOURCE: LBL LONG RANGE DEVELOPMENT PLAN (AUGUST 1987)

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The replacement HWHF would contain waste handling areas and office space in a two-story building with a maximum height of 37 feet from grade level. The adjacent exterior of the facility would contain a covered 10-foot by 50-foot storage area for flammable liquid drums, a 10-foot by 10-foot shelter for oxidizer storage, and an identical structure for collection of solvents. Two exterior yard areas would form part of the facility. Other site improvements involved in development include a utilities corridor (i.e., gas, electric, water, and sanitary sewer); related outdoor lighting; perimeter fencing; and storm drainage facilities. Crib retaining walls also would be provided to retain earthwork. Figure 2-3 shows the layout of the proposed facility and site area.

Building Design

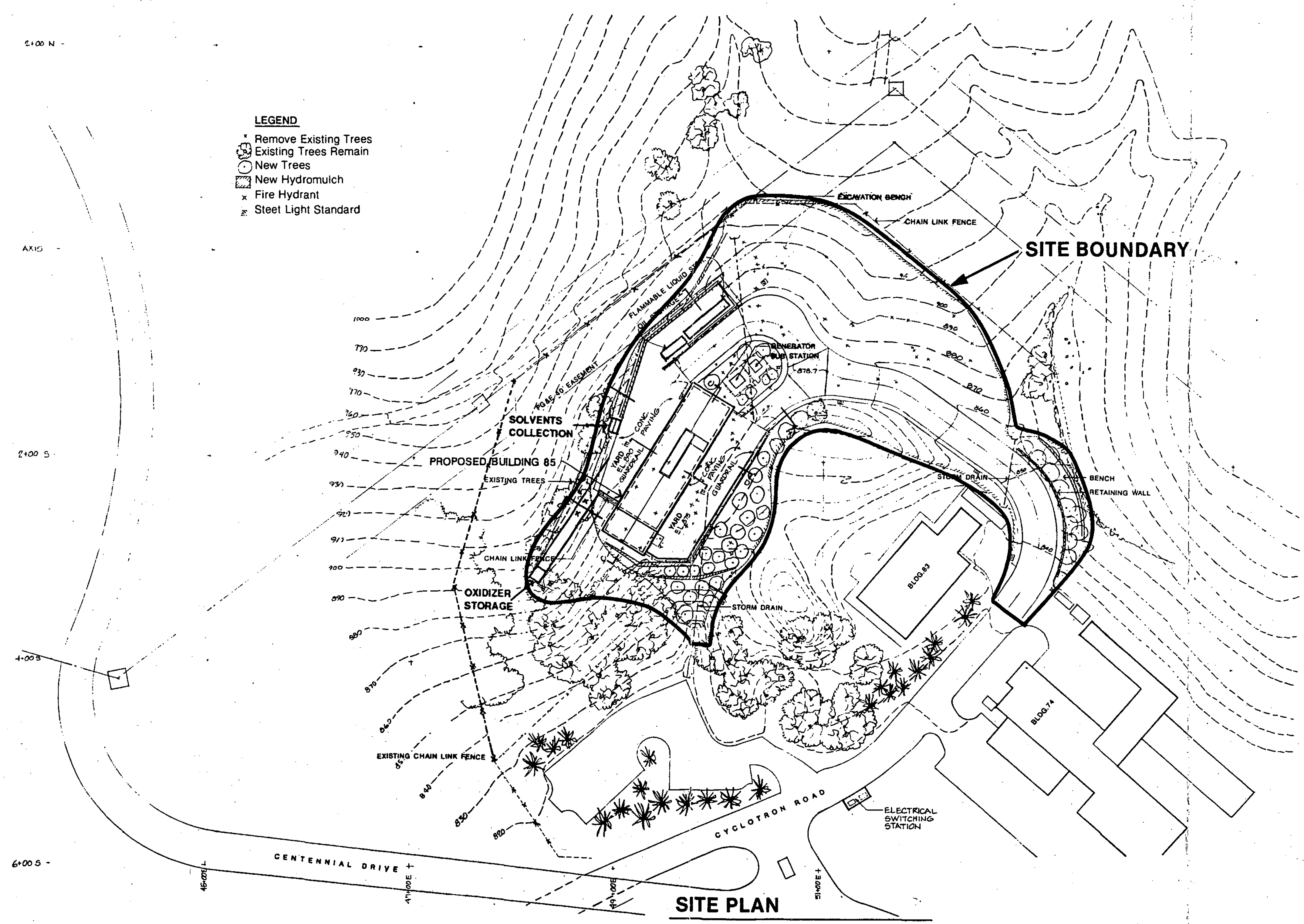
Every effort has been made to incorporate the most current information regarding the design of the proposed facility into this EA. During the design process, slight modifications may be made to the facility design based on audits of existing HWHF operations, changes in regulatory requirements or supplemental review of replacement HWHF design. In general, such modifications are not expected to affect the size of the HWHF or the quantity of hazardous waste to be handled, and therefore would not be expected to produce previously unidentified environmental impacts or to substantially alter the level of impacts identified in this document.

The replacement HWHF would be designed in compliance with DOE Order 6430.1A, "General Design Criteria." The replacement building would contain approximately 12,400 gross square-feet (gsf). The structure would have a footprint of approximately 6,900 square feet (sf). The first floor would house waste storage, chemical preparation and storage, and compactor and solidification operations. The second floor would contain space for decontamination, clean supply storage, mechanical equipment, and administrative offices. The building would also have a mechanical penthouse. Floor plans and building elevations for the facility are shown in Figures 2-4 and 2-5, respectively.

Personnel and vehicular access to the first floor level would be from the east side of the building while access to the second floor would be from the west side. An internal stairway and a freight elevator would connect the two floors. Construction and arrangement of the new facility would allow forklift access to the second floor for dry/clean storage, mechanical and emergency equipment.

PROPOSED SITE PLAN

FIGURE 2-3



SOURCE: KENNEDY/JENKS/CHILTON ARCHITECTURAL DIVISION

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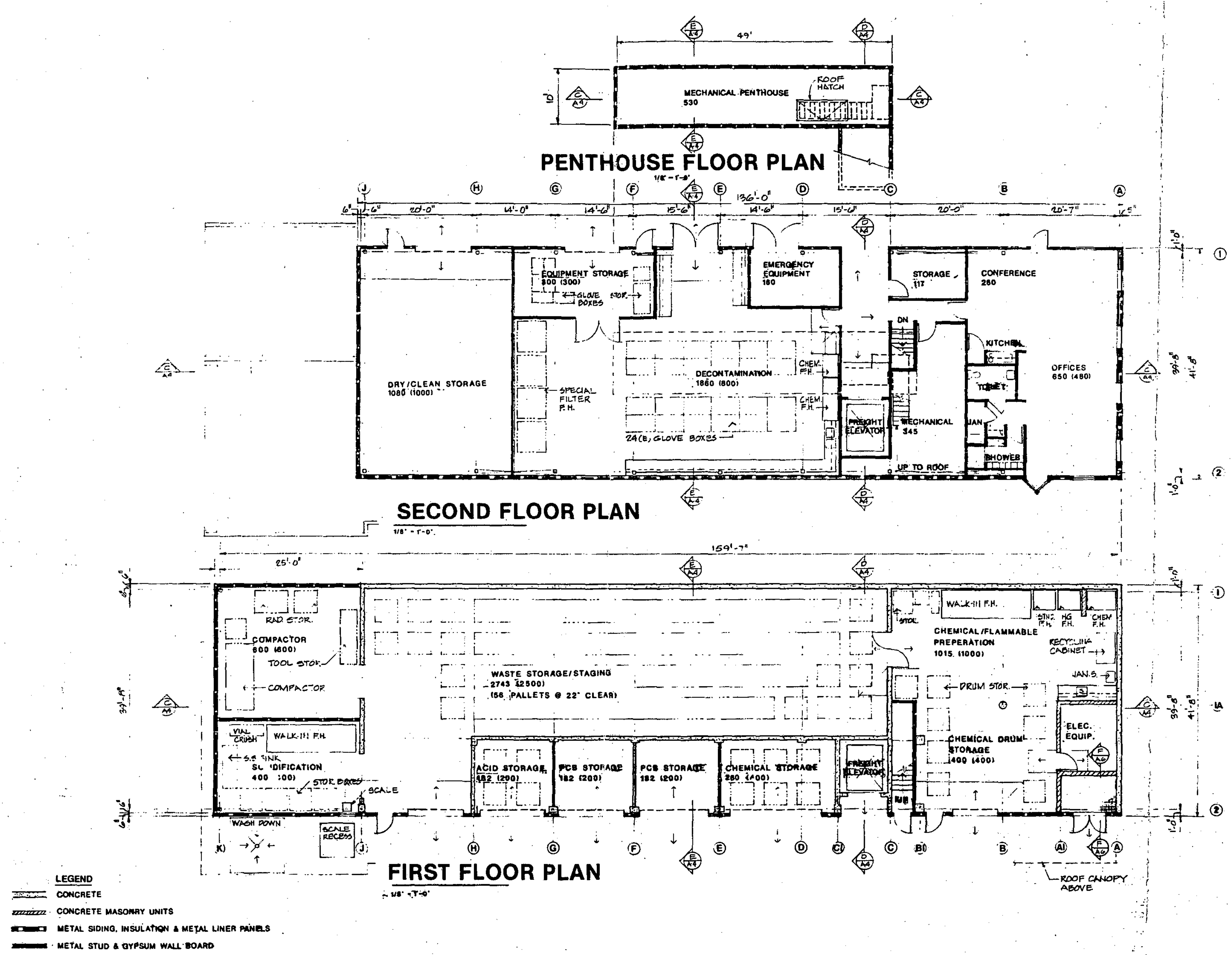
FLOOR PLANS

FIGURE 2-4



SOURCE: KENNEDY/JENKS/CHILTON ARCHITECTURAL DIVISION

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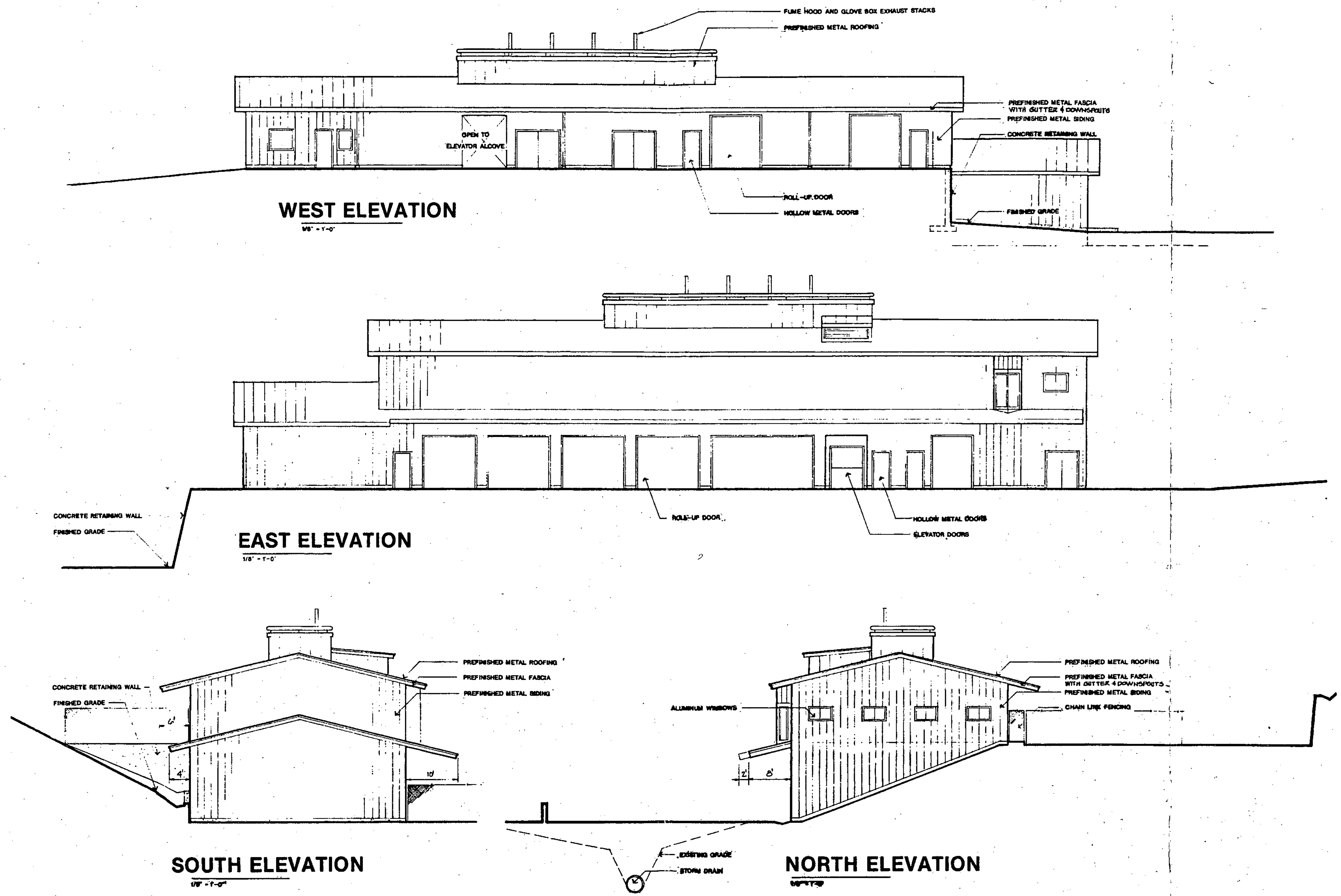
BUILDING ELEVATIONS

FIGURE 2-5



SOURCE: KENNEDY/JENKS/CHILTON ARCHITECTURAL DIVISION

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The building structure would be a reinforced concrete and steel frame with pre-finished exterior metal siding. The east and west elevations would contain large roll-up door openings and windows. The mechanical penthouse would be clad in pre-finished metal roofing and would be elevated a short distance above the main ridge line of the roof. The ridge line would be about 35 feet above the first floor level.

The building would be partially underground in the existing hillside to take advantage of the existing terrain and to relate the structure to adjacent land forms. It would appear as a one-storystructure from the west and as a two-story structure from the east. The profile of the roof would contain sloping surfaces with overhanging eaves and the building would have strong horizontal lines to help blend the structure with its setting.

Containment and Safety Features

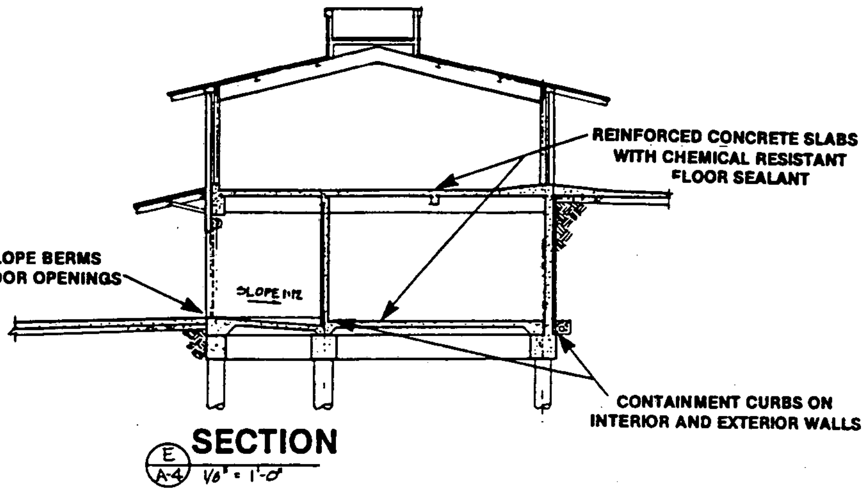
Several provisions have been included in the replacement facility design that are not part of present operating methods employed at the existing facility. These additional provisions at the proposed HWHF would help to further reduce the risk of accidental release of hazardous wastes. The proposed HWHF would be designed to provide safe operational conditions for both normal and potential upset scenarios.

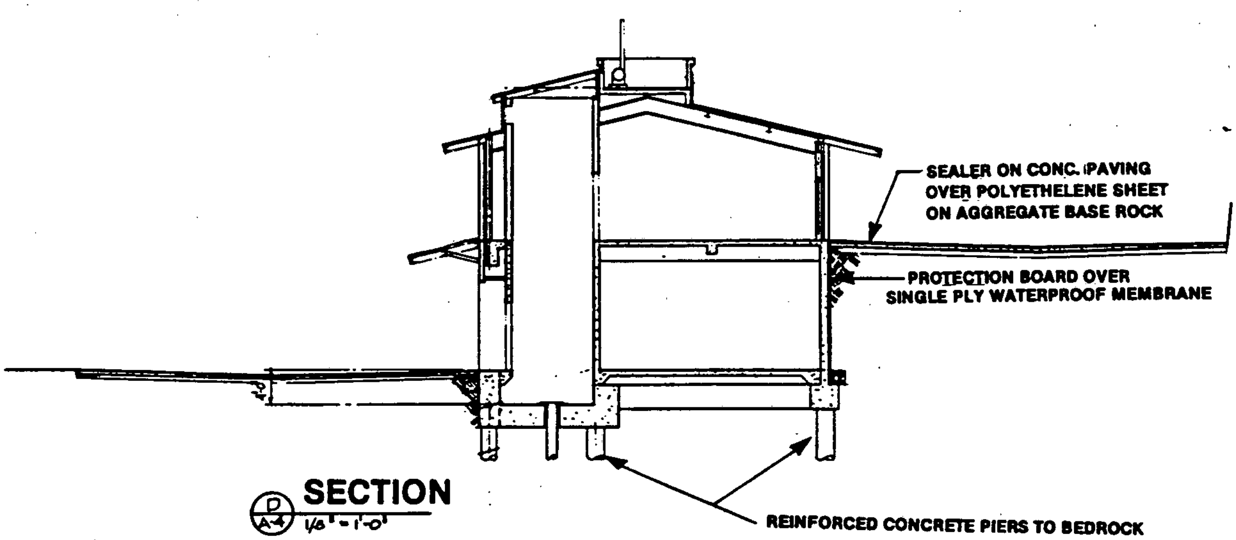
Facility design would incorporate features and specifications based on Environmental Protection Agency (EPA) design standards and on knowledge gained from past HWHF operation. The design will also conform to the fire protection criteria delineated in DOE Order 5480.7, "Fire Protection." The building would provide specially designed operational and administrative space, efficient waste handling areas, and improved environmental and safety conditions. Containment and safety features included in the proposed HWHF are discussed below and are illustrated in Figure 2-6, which shows two cross sections through the building.

The HWHF building and yard areas would be constructed on rock and engineered fill compacted and buttressed by reinforced concrete retaining walls designed to resist seismic loading. The building foundations would consist of drilled piers anchored into bedrock and the building's ground floor slab would be reinforced concrete. The slab design would incorporate engineering specifications which would prevent cracking of the floor during an earthquake. An evaluation of

CONTAINMENT AND SAFETY FEATURES

FIGURE 2-6





SOURCE: KENNEDY/JENKS/CHILTON ARCHITECTURAL DIVISION

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potential impacts resulting from an earthquake or other potential accident is provided in Section 4.10, Hazardous Materials.

Containment for accidental release of hazardous materials would be provided in all handling and storage areas. The building would be designed so that in the event of a spill or storage container breach, liquid would not pass through the flooring. Floors would be of concrete covered with a neoprene layer beneath an impermeable membrane. The material used for this membrane wouldbe a chemical-resistant, epoxy resin-based coating product which would be trowel-applied at a quarter-inch minimum thickness and able to withstand high-impact loads such as forklift traffic.

To isolate potential spills within the building, each functional area where hazardous materials are handled or stored would have sloped berms at all door openings and perimeter concrete curbs at the base of all interior and exterior walls. Curbs would be coated with the epoxy material described above. Under upset conditions, incompatible chemicals would be prevented from mixing by the design of the building floor slab.

Ventilation Controls

The HWHF would be divided into six zones for ventilation purposes. The six zones would be: Zone 1 - Office Area; Zone 2 - Decontamination, Equipment Storage; Zone 3 - Waste Storage/Staging; Zone 4 - Chemical/Flammable Preparation, Chemical Drum Storage, Flammable Solvents Drum; Zone 5 - Dry/Chemical Storage; and Zone 6 - Acid Storage, Polychlorinated Biphenyls (PCB) Storage, Chemical Storage. All zones except the office area (Zone 1) would be maintained at negative pressure relative to the exterior atmosphere and all fume and air emissions would be vented through appropriate fume hoods and ventilation systems.

Fume hoods would be distributed throughout the facility. Up to sixteen vented glove boxes (containment vessels for handling radioactive materials) would be located in the decontamination area. All glove boxes and fume hoods in the HWHF building would exhaust through ventilation stacks. Air intakes for ventilation would be located at the west end of the building, upwind of exhaust air discharge points.

Essential equipment and controls would have emergency power supply to assure continued operation of the ventilation system and the maintenance of negative pressure during power outages.

For additional discussion of air emissions during normal and potential upset conditions at the facility, see Section 4.7, Air Quality, and Section 4.10, Hazardous Materials.

Exterior Yard Areas

Outside the HWHF building, the surface of the covered storage and adjacent yard areas would be sealed concrete. Yard surfaces would comprise approximately 20,000 sf of area. Yard areas would slope inward and be drained by three catch basins in the upper yard and two in the lower yard. A collector sump for each yard area (i.e., upper and lower) would be provided. The catch basins in each yard would drain to a valved sump. The valved sumps would be closed whenever drums of liquid wastes are handled in the yard areas. Any potential spill in the yard areas would be contained in the sumps and cleaned up in accordance with approved Operational Safety Procedures. The covered storage area for flammable liquids would have a recessed floor and perimeter berm to contain potential spills.

Site Development

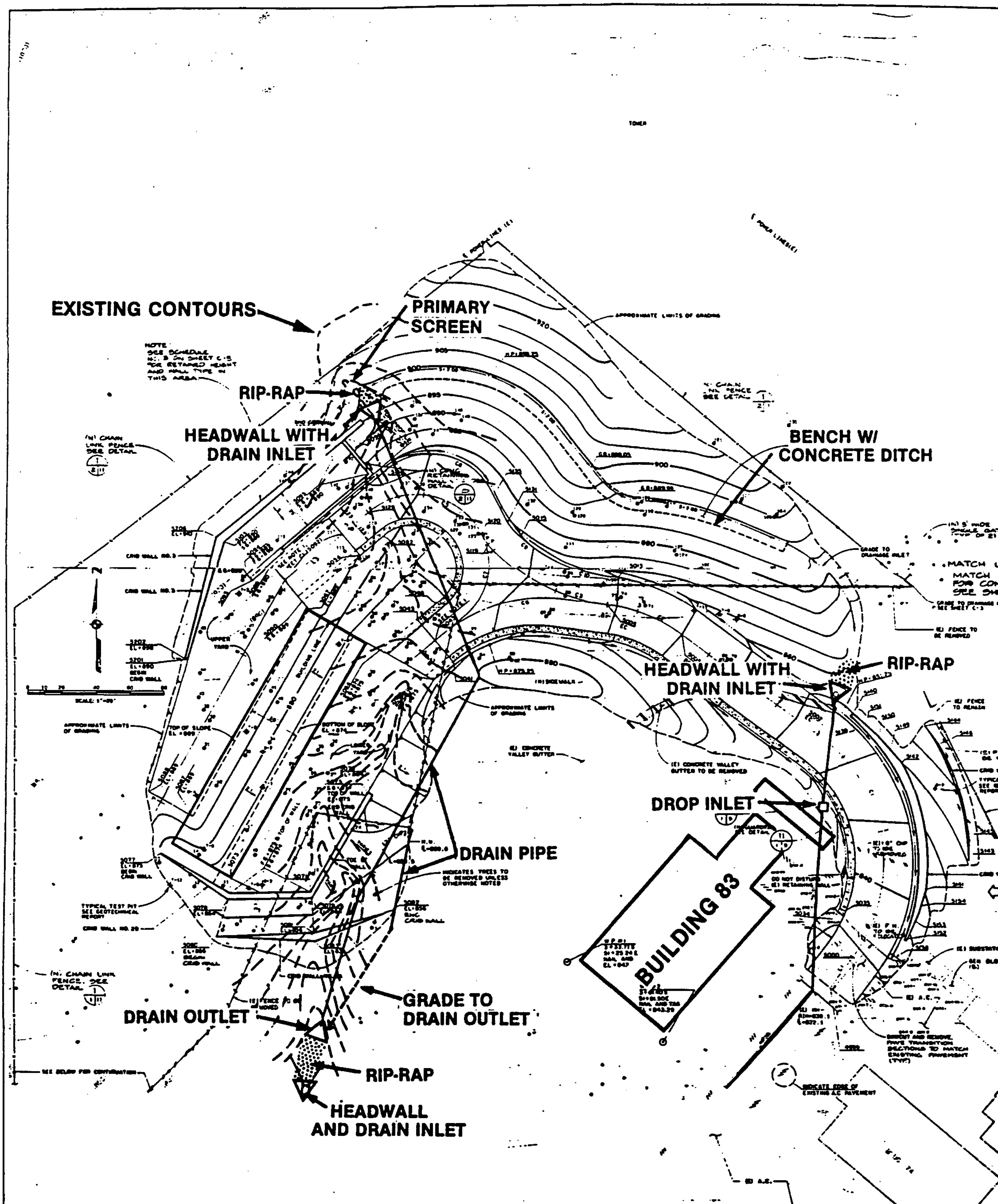
Proposed facilities for the site include an electrical sub-station, an external emergency generator. Each of these areas would be protected by security fencing. Together, the areas would cover about 4,800 sf. In addition to the LBL perimeter security fence, the HWHF would be surrounded by a secondary security fence. Utilities for the facility including water, gas, electric, and sewer lines would be placed beneath the proposed road alignment. Drainage facilities would consist of a culvert to carry storm water runoff from the ephemeral stream that crosses the western portion of the site and other drains, benches and rip rap as shown in the Grading and Drainage Plan (Figure 2-7).

A new access road approximately 400 feet long would connect the facility to the existing LBL road network. The access road would rise 45 feet along its length, having a designed road width of 34 feet to accommodate 60-foot long semitrailers which would serve the HWHF. The right-of-way for the access road would include two traffic lanes, a four-foot sidewall and appropriate shoulders. Because typical fire breaks at LBL have an average designed width of 35 feet, the road would serve as a fire break and additional removal of vegetation for fire break purposes would not be needed.

At its terminus, the road would reach a U-shaped area that would comprise the access to the upper and lower yards as shown in Figure 2-3. Portions of the existing hillside to the east of the road and access area would be retained using crib retaining walls. The crib walls would have plantings on

GRADING AND DRAINAGE PLAN

FIGURE 2-7



SOURCE: KENNEDY/JENKS/CHILTON

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their exterior face and would be used to integrate site development with the surrounding terrain and to reduce the extent of cut and fill slopes.

Approximately 36,000 sf of area within the project boundary would be landscaped as part of the project as shown in the Landscaping Plan (Figure 2-8). Areas disturbed by construction would be hydroseeded as soon as feasible upon the completion of grading in order to reestablish vegetative cover and control erosion. Proposed landscaping would include: trees--oak, bay, pine, laurel and redwood; shrubbery--coyote brush and oleander; and crib wall plantings--manzanita, juniper, rosemary, and toyon. Further discussion of impacts on vegetation is provided in Section 4.4, Vegetation and Wildlife.

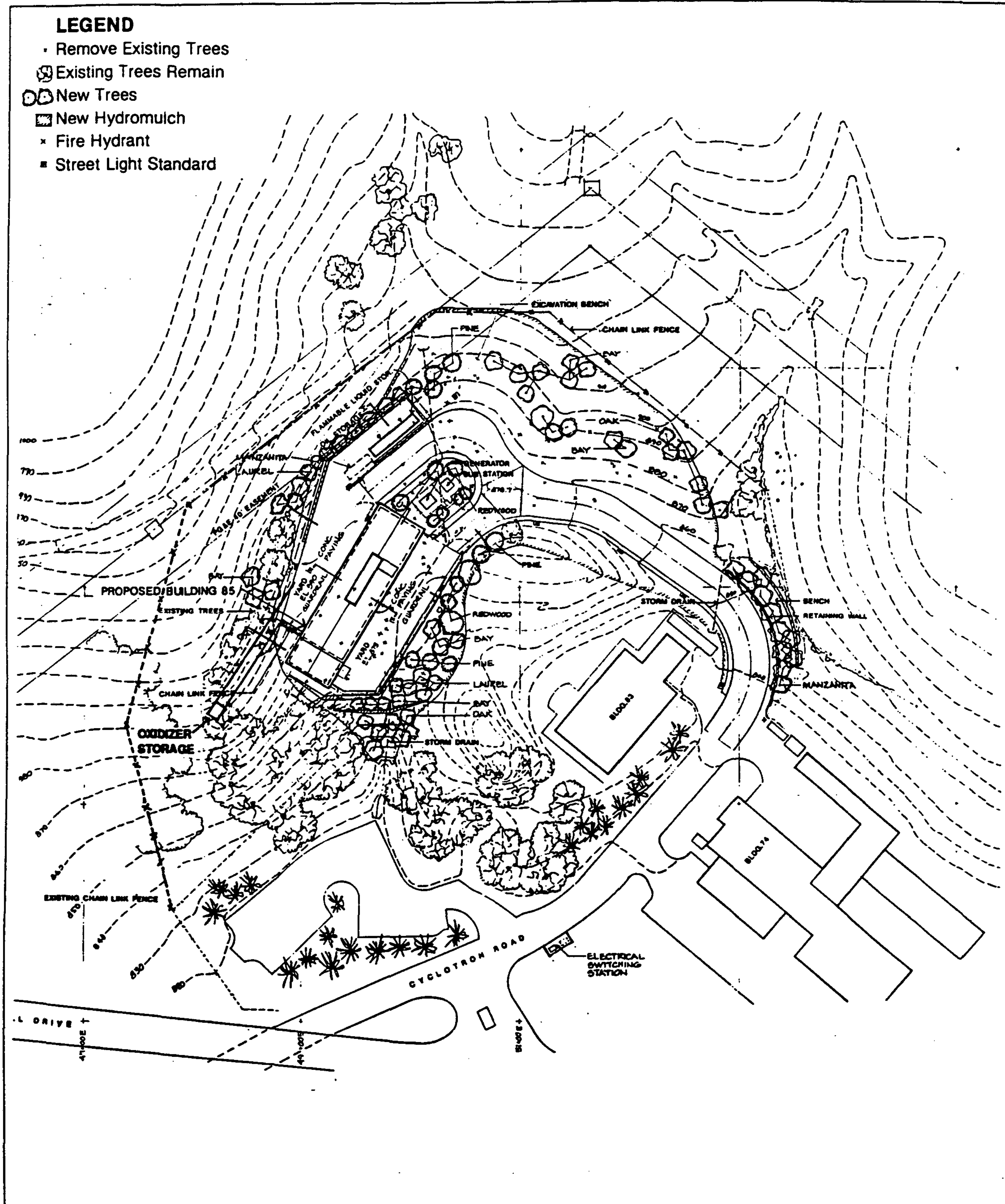
<u>Construction Activities</u>

Construction for the new HWHF would last approximately 19 months, of which about 6 months would be dedicated to site work (i.e., clearing vegetation, grading). During this period, the Building 83 parking lot would be used by the contractor as a staging area. It is estimated that at the peak of construction, 60 construction workers would be at the site daily. Parking for workers' vehicles would be restricted to the construction and staging areas.

FACILITY OPERATION

At the replacement facility, hazardous waste handling would be performed in the same manner as at the existing HWHF. In the handling process, hazardous wastes are delivered in small quantities to the HWHF from various locations within LBL on a routine basis. All containers for hazardous wastes are transported from the generator to the HWHF in impact-rated drums or lockable Department of Transportation (DOT)-equivalent shipping containers which are permanently bolted to the transport vehicles. Marked pickup trucks are primarily used to carry materials to the HWHF. An average of six vehicle trips per day are involved in the transport of hazardous wastes to the facility.

The hazardous wastes received by the facility include a wide range of chemical substances with a variety of associated hazards. The categories of hazardous wastes handled consist of corrosive liquids, waste solvents, waste oils, waste coolant, waste empty drums, asbestos, contaminated soils, fluorescent light bulbs, motor vehicle batteries, metal sludges, PCBs, mixed radioactive wastes, radioactive wastes, lab packs, mercury waste, paint materials, oily rags and spent activated carbon. These waste categories correspond to the categories listed in the current Operation Plan for



SOURCE: KENNEDY, JENKS AND CHILTON

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the hazardous waste handling facility. No infectious or biomedical waste is handled at the HWHF. A description of the hazardous wastes handled at the HWHF, including a complete list of hazardous waste materials (Table 4-3), is provided in Section 4.10, Hazardous Materials.

Wastes originate from the many different research laboratories at LBL, where they are appropriately characterized, segrated and assembled by the investigators for transfer to the HWHF. The wastes are packaged for transport to the HWHF according to applicable standards. Packaging methods vary depending on the type of waste, its hazard classification, and its physical properties (i.e., size, physical form, chemical characteristics, etc.). Hazardous chemicals are packaged in plastic bags, cardboard containers, safety buckets and other containers as needed. Packaging for radioactive materials uses carboys (polyethylene containers), jugs, bottles, lab-packs, cans and drums as described below.

All radioactive materials transported from the LBL generator to the HWHF are contained in either drums or boxes permanently mounted to the delivery trucks. The drums used for transporting radioactive materials (17H drums) are designed to DOT standards and have the ability to retain integrity if dropped or subjected to extreme heat or other adverse conditions. Before delivery to the HWHF, waste packages are inspected to determine the estimated amount of radioactivity, the physical and chemical composition of the waste, and the radionuclides it contains. This information is recorded on radioactive waste tags provided for each package.

The packaging of radioactive waste, as with other wastes, for transport to the HWHF is performed by the LBL unit that generates the waste. Packaging methods and maximum allowable package activity for radioactive materials vary depending on the type of waste and its physical properties. A significant portion of the total radioactive materials handled by the HWHF are held in waste packages and containers that remain sealed from the point of collection until their disposal off-site at a DOE-approved disposal facility.

All solid waste, compactible and non-compactible, with low specific activity is packaged in plastic bags and multi-layer paper cement sacks, or metal cans. Any sharp objects (e.g., glass spitzers) are packaged in cardboard containers before being placed in cement bags. This waste is placed in DOT 17H drums and lockable containers on transport vehicles for transfer to the HWHF building where compactible and non-compactible wastes are placed in separate storage bins for further packaging and treatment. Transuranic wastes are triple-contained in cardboard containers, plastic sealed bags, and metal containers (one and five gallon).[1] Such wastes are packaged on a case-by-case basis.

Liquid waste with low radioactivity is transported in leak-proof quart bottles or 5-gallon carboys inside secondary plastic bags which are placed in 23-gallon 17H drums with absorbent material. Tritium waste, which is the most abundant form of radioactive material handled by the HWHF, is absorbed in silica gel in polyethylene bottles. These bottles are encapsulated in asphalt in one-gallon cans which are sealed with a canning machine.

Waste Preparation and Disposal

LBL has identified categories for the range of hazardous wastes generated at the Laboratory. These categories are described above under the heading "Facility Operation." The waste stream materials are prepared at the HWHF for safe transport off-site and off-site disposal. Preparation methods may involve compacting solids, combining compatible materials, lab packing, and placing materials in secured drums. Tritiated materials (substances containing radioactive hydrogen) are combined in a tar matrix in sealed containers. All containers are identified with appropriate labels as specified by the EPA, the California Environmental Protection Agency (Cal EPA), DOE, DOT and LBL's Environmental Health and Safety (EH&S) Department.

The following activities are routinely performed at the HWHF:

- Low-level radioactive wastes are solidified and prepared for shipment to an off-site Treatment, Storage, and Disposal Facility (TSDF).
- Flammable liquids are combined for shipment to recycling facilities.
- Mercury is collected for off-site disposal at DOE- and State of California-approved disposal facility.
- PCBs and waste oils are stored in drums for shipment to an off-site incinerator.
- Asbestos is sealed in bags and stored in a locked container for shipment to an off-site TSDF.
- Induced metals (metals that have become radioactive from use in high-energy particle experiments) are stored until transported to a licensed radioactive disposal facility.

- Transuranic wastes such as laboratory-contaminated equipment and/or materials are solidified and/or packaged for shipment to an off-site TSDF.

Prepared wastes are stored at the HWHF until sufficient quantity exists to comprise a single truck load for shipment off-site. Wastes are transported periodically by a licensed hazardous waste hauler for recycling or for final disposal at a licensed treatment, storage or disposal facility. Approximately ten trips per year by tractor trailer from the facility to DOE- and State of California-approved off-site facilities are made. A further discussion of hazardous materials handling procedures is contained in Section 4.10, Hazardous Materials, of this assessment. Section 4.8, Traffic and Circulation, further discusses the frequency of deliveries to the HWHF and the transportation of waste to off-site disposal facilities.

Upon completion of the replacement HWHF, management of LBL's hazardous waste would be transferred to the new facility. Operation of the replacement HWHF would require a hazardous waste facilities permit issued jointly by EPA and Cal EPA. The existing HWHF has a hazardous waste facilities permit issued by Cal EPA on November 7, 1983, at a time when it had authorization from EPA to do so. LBL has recently prepared an application for renewal of that permit. The application includes the replacement HWHF.

Hazardous waste would be collected, packaged and prepared for transport to off-site disposal facilities approved by the EPA, Cal EPA, or DOE. The essential waste handling operations at the proposed facility would be the same as at the existing facility. The replacement facility would not include the burning of hazardous waste, on-site disposal, or the handling of waste from generators other than LBL.

CLOSURE PLAN FOR EXISTING HWHF

The proposed replacement LBL HWHF action would involve closing facilities which currently house HWHF operations (Figure 2-9). The main facility to be closed would be the existing HWHF building (Building 75A). Other specific facility areas, their present function, and the steps which would be taken during closure are described below. The location of the existing HWHF facilities is shown on Figure 2-2. Closure would occur in accordance with the Closure Plan included in the amended permit application, as approved by Cal EPA and EPA.

EXISTING HWHF AND VICINITY

FIGURE 2-9

SOURCE: EIP ASSOCIATES

d6180.1A

<u>Building 69</u>

An area adjacent to this building currently houses the storage of waste solvents in 55-gallon drums. During closure operations, all drums would be removed and delivered to an approved off-site recycling or disposal site. Waste oils are stored in a 2,000-gallon underground tank adjacent to Building 69. This tank would be closed by removal in accordance with the LBL HWHF closure plan and applicable requirements of CAL EPA and the City of Berkeley. Closure steps likely would include removal of waste oils by a licensed vendor for recycling; removal of the tank from the ground and transport to a licensed facility for cleaning and recycling or disposal; sampling of soil beneath the tank to determine whether the tank leaked; and, if necessary, appropriate corrective action.

<u>Building 75, Room 131</u>

This area currently is used for storing waste chemicals and packaging lab packs for shipment to a DOE/EPA approved disposal site. Closure operations would involve packaging all waste chemicals and shipment to an off-site disposal location. Room 131 and the adjacent area would then be cleaned of chemical residues per the approved Closure Plan. Appropriate samples would be taken and evaluated by LBL as required by CAL EPA and EPA. Radioactive contamination surveys would be necessary due to the solidification operations that have occurred in this area. If contamination is found, it would be decontaminated in place to acceptable levels per DOE Order 5400.5, or the material or surfaces would be removed and treated as radioactive waste per applicable requirements.

<u>Building 75, Room 127</u>

This area now is used as a decontamination facility for radioactive materials and the preparation area for radioactive waste. All equipment would be relocated to the replacement HWHF or disposed of as radioactive waste. Radioactive waste would be prepared per applicable DOT and DOE Order 5820.2A requirements and shipped off-site by a licensed vendor to a DOE-approved disposal site.

All floor, wall, ceiling, fume hood and furniture surfaces would be surveyed for residual radioactivity and any contaminated material would be decontaminated in place or else disposed of as radioactive waste per DOE Order 5400.5 requirements. Interior room surfaces would be cleaned by vacuuming or wet mopping. Test samples or "swipes" would be taken of all representative surfaces and evaluated for radioactivity.

Building 75A

Storage of waste drums prior to shipment and compaction of radioactive wastes presently take place in this building. The prefabricated structure would be decommissioned and decontaminated per the approved Closure Plan. It would then be dismantled and stored for possible future use. Closure operations would involve relocating waste drums to the replacement HWHF. The existing compactor and other miscellaneous equipment also would be relocated to the replacement HWHF.

All interior surfaces of the building would be surveyed for radioactivity. If contamination is found, it would be decontaminated in place to acceptable levels per DOE Order 5400.5, or the material or surfaces would be removed and treated as radioactive waste per applicable requirements. The interior of the building would be vacuumed or wet mopped after all materials have been removed. Appropriate soil and groundwater samples would be taken and evaluated as mandated by CAL EPA and EPA.

Building 75 Yard Area

The area is used for storage of waste acids in a bermed area and storage of materials awaiting disposal. During closure operations, all waste materials would be relocated to the replacement HWHF. Storage cargo containers also would be relocated to the replacement HWHF. The yard area would be surveyed by LBL for residual radioactivity. If contamination were discovered, it would be decontaminated in place according to requirements of DOE Order 5400.5 or removed and treated as radioactive waste per DOE Order 5820.2A requirements. Soil and groundwater samples would be taken and evaluated as mandated by CAL EPA, EPA and other applicable requirements.

2.3 REGULATORY AND INSTITUTIONAL BACKGROUND

The LBL site is leased by DOE from the University of California. DOE is the responsible agency for all activities taking place on the LBL complex, including the handling of hazardous waste. The Regents of the University of California and DOE share authority to review and approve proposed building projects for LBL. Certain hazardous waste management activities at the HWHF are regulated by the EPA and CAL EPA. Activities at the HWHF and other buildings within the LBL complex are regulated by more than one agency. In addition to the comprehensive safety and inspection programs implemented by the LBL EH&S Department, additional inspections are carried out by regulatory agencies at the HWHF.

Hazardous waste management activities at the HWHF may be subject to the regulatory jurisdiction of federal, State, regional and local agencies under a variety of environmental statutes and regulations. For each area of environmental regulation that may apply to hazardous waste management activities at the HWHF, Table 2-1 lists the principal statutes and regulations, and provides the identity of the agencies responsible for implementing those environmental requirements. Compliance with all applicable laws and regulations concerning hazardous material and waste management would be part of the action.

HWHF PERMITS AND OPERATIONS

LBL functions as a unit of the University of California (UC or the University). The University and LBL comply with applicable local, State, and federal regulations identified in Table 2-1. Inspections of the HWHF are performed periodically by the DOE and the CAL EPA; LBL's EH&S Department conducts weekly inspections. In addition, the University's Health, Safety and Environment Advisory Committee has oversight responsibility for environmental, health and safety policies at UC-operated national laboratories, and exercises review authority of LBL activities.

The key permits necessary for operation of the replacement HWHF are the operating permits granted by EPA (under RCRA) and CAL EPA (under Title 22). As previously mentioned, the existing HWHF has an operating permit which was issued on November 7, 1983. LBL has recently prepared an application for renewal of that permit. The application includes the replacement HWHF. The backup generator diesel tank would also require an underground storage tank permit issued by the City of Berkeley.

All activities involving hazardous wastes at LBL are conducted in accordance with LBL's Hazardous Waste Management procedures (July 1986). These procedures conform to the requirements of applicable law as listed in Table 2-1. The use, storage and disposal of toxic chemicals is governed by the LBL Health and Safety Manual, Chapter 5 (July 1986). As part of LBL's hazardous wastemanagement program, a detailed inspection of hazardous waste storage areas is carried out on a weekly basis. The inspections include checks of drum integrity, storage compatibility, and structural integrity, and verification of labeling. Records of inspection activity are maintained at the site.

TABLE 2-1

LIST OF PRINCIPAL STATUTES AND REGULATIONS POTENTIALLY APPLICABLE TO HWHF OPERATION

Subject	Statute	Regulations	Implementing Agency
Radioactive Materials	Atomic Energy Act 42 United States Code (USC) § 2011, et seq.; DOE Organization Act 42 USC § 7101, et seq.	10 Code of Federal Regulations (CFR) Part 71; DOE Orders, including 5820.2A	U.S. Nuclear Regulatory Commission (NRC); DOE
Hazardous Materials Transport[1]	Hazardous Materials Transportation Act 49 USC § 1801, et seq.; Motor Carrier Safety Act 49 USC App. § 2501, et seq.	49 CFR Parts 178-180[1]	Department of Transportation (DOT)
	Hazardous Waste Control Law Health & Safety Code, § 25100, et seq.	22 California Code of Regulations (CCR) § 66001, et seq.	Cal EPA
Air Quality	Clean Air Act (CAA) 42 USC § 7401, et seq., as amended by Public Law 101-549	40 CFR Parts 2, 50-87, and further regulations to be promulgated	EPA with authority delegated to the California Air Resources Board (ARB) and local air districts[2]
	California Air Resources Act Health & Safety Code § 39000 et seq.	17 CCR § 60000, et seq.	ARB and local air districts[2]
		Rules and Regulations of the Bay Area Air Quality Management District (BAAQMD)	BAAQMD
	Air Toxics "Hot Spots" Information and Assessment Act of 1987, Health & Safety Code § 44300, et seq.	17 CCR § 93300, et seq.	ARB and local air districts[2]
Underground Storage Tanks	Resouce Conservation and Recovery Act (RCRA) Subtitle I, 42 USC § 6991, et seq.	40 CFR Parts 280-281	EPA and, under Memorandum of Understanding with EPA, State Water Resources Control Board (SWRCB) and local agencies[3]

Subject	Statute	Regulations	Implementing Agency
	Underground Storage of Hazardous Substances, Health & Safety Code § 25280, et seq.	23 CCR § 2610 et seq.	SWRCB and local agencies[3]
Emergency Planning and Hazardous Materials Disclosure	Emergency Planning and Community Right-to-Know Act (EPCRA), 42 USC § 11001, et seq.	49 CFR Parts 355, 370-372	EPA, National Response Center, and State and local emergency response authorities[4]
	Hazardous Materials Release Response Plans and Inventory Health & Safety Doce § 25500, et seq.	19 CCR § 2620 et seq.	State Office of Emergency Services (OES), and counties and cities[4]
	Hazardous Materials Management, Health & Safety Code § 25531, et seq.	19 Cal Code Regs. § 2720 et seq.	OES and local agencies[4]
Hazardous Waste Handling and Storage	Resource Conservation and Recovery Act (RCRA), Subtitle I, 42 USC § 6991, et seq.	40 CFR Part 264	EPA
	Occupational Safety and Health Act	29 CFR (Various Sections)	Occupational Safety and Health Administration
	Hazardous Waste Control Law Health & Safety Code, § 25100, et seq.	22 CCR § 66001, et seq.	DHS

1 See also various sections of the California Vehicle Code and implementing regulations administered by the California Highway Patrol (CHP) and the State Fire Marshal.

2 For LBL, the local air district is the Bay Area Air Quality Management District.

3 Local agency for LBL is City of Berkeley Department of Health and Human Services, Environmental Health Division, under agreement with the City of Oakland for portions of LBL located in Oakland.

4 For LBL, local emergency response authorities include Alameda County (Division of Environmental Health--HazMat Specialist) and the City of Berkeley (Environmental Health Division).

Tanner Act

Assembly Bill (AB) 2948, commonly known as the Tanner Act (1986), encourages hazardous waste management planning on a county-wide basis and calls for the development of County Hazardous Waste Management Plans (HWMP). Such plans include guidelines for locating "off-site" hazardous waste handling facilities, or facilities that accept hazardous waste from generators not in the same location as the facility. County HWMPs also include recommendations for "On-Site Waste Management" at facilities such as the proposed facility and set out a number of goals for hazardous waste management. Alameda County prepared a Draft Hazardous Waste Management Plan for the County which was not approved by the State, and is currently in the final stages of revising the Plan for re-issuance. Approval of the Alameda County HWMP by the Alameda County Waste Management Authority is being considered at the time of publication of this document.[3]

Because the LBL replacement HWHF, like the existing HWHF, is not an "off-site" facility, the provisions in the Alameda County HWMP for locating such facilities would not apply to the proposed action. County HWMPs recognize the important role played by hazardous waste handling facilities such as the facility proposed by LBL. When operational, LBL's relocated facility would be used to hold hazardous waste for a period of up to one year before transfer to an off-site treatment, storage or disposal facility. Waste from the relocated facility would be ultimately sent to an authorized TSDF. LBL supports the goals in the County's HWMP, and the existing and replacement facilities would be consistent with county waste management goals (see also Section 4.1, Land Use and Planning).

Waste Reduction and Minimization

The goal of LBL's Waste Reduction and Minimization program (November 21, 1986) is to reduce waste and thereby ensure compliance with applicable local, State and federal programs for waste reduction. LBL's policy is to reduce the amount of effluent in sanitary sewers, eliminate PCBs and PCB oil in transformers and light ballasts, and reduce hazardous waste production. LBL's Waste Minimization Plan assigns this responsibility to the Programs generating the waste. LBL has an established policy for the recycling and recovery of solvents, oils and coolants, and mercury and lead acid batteries. LBL is active in preventive waste generation techniques and provides an ongoing training program for staff involved in hazardous waste handling and clean up. The Alameda County HWMP's emphasis on source reduction and waste minimization is a goal shared by LBL.

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[1] Transuranic elements have an atomic number greater than 92. Wastes that include transuranic materials have a relatively greater potential biological hazard from inhalation or ingestion. These wastes therefore receive additional packaging after removal from glove boxes at the HWHF.

[2] The transfer of strong acids and bases to Building 77 treatment facility would not change as a result of the project. The Building 77 treatment facility is not part of the proposed project.

[3] Rory Kessler, Senior Planner, Alameda County Waste Management Authority, personal communication with EIP Associates on July 29, 1991.

3. ENVIRONMENTAL EFFECTS SUMMARY AND ALTERNATIVES ANALYSIS

3.1 ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

The proposed action would potentially create short-term and long-term effects on the existing environment. The summary table in this chapter notes the potential environmental impacts and measures designed to lessen adverse effects. A discussion of specific impact categories is provided in Chapter 4, Environmental Issues.

The proposed action would relocate existing HWHF operations to another part of the LBL site; it would not increase the number of HWHF employees or change the nature or amount of hazardous waste handling activities. Construction of a replacement HWHF is consistent with LBL's LRDP and provides for the planned relocation of activities at the LBL site. The action would not conflict with other adopted environmental plans or goals, or with established uses of the area.

No potential impacts to historical and cultural resources have been identified for the action. However, for the protection and preservation of potential archaeological finds in accordance with State law, the County Coroner would be notified and appropriate measures determined if human remains were encountered during construction.

The action would affect the visual quality of the existing HWHF site by removing outdoor storage containers. Also, the replacement facility and associated yard, road, utility, and landscaping areas would create visual quality impacts at the proposed action site. Because the existing HWHF building is not a significant architectural structure and does not contribute to the visual quality of the LBL site, its closure would not be considered an adverse impact of the action. The replacement facility would be designed to be compatible with the topography of the surrounding site. Locating the building behind trees and the provision of landscaped buffer zones would mitigate visual impacts of the action.

The action would result in the removal of existing vegetation at the site and would affect wildlife habitat. The removal of approximately 37 native trees at the site is considered an unavoidable adverse impact of the action. However, the direct loss of habitat is not considered regionally significant. The action would not affect any threatened or endangered species or the habitat of such a species or interfere substantially with the movement of any resident or migratory wildlife species. No threatened or endangered species of animal or associated plant has been discovered at the proposed site. The site would be replanted and landscaped after the completion of construction.

Grading for the proposed building, yard, parking and services areas, and for the access road would change the existing land form on the proposed site. As part of the site development, a portion of the ephemeral stream would be filled and an appropriate storm drainage system installed to accommodate surface runoff. The grading plan was developed after a site inspection by the California Department of Fish and Game which determined the absence of significant habitat and valuable wildlife resources. Excess cut material would be transported to a landfill off-site. Site preparation would be conducted according to the recommendations of the project geotechnical report in order to minimize the potential for damage resulting from landsliding and earthquake groundshaking.

The action would alter existing drainage patterns at the proposed site and would increase the amount of storm water runoff by adding impervious surfaces. However, the estimated increase to storm water runoff is not considered significant. Construction activities, which could affect water quality downstream of the site by creating potentially erosive conditions, would be conducted according to the standards discussed in Section 4.5, Geology, Soils and Seismicity. Erosion control practices would reduce the potential for erosion and subsequent water quality degradation.

Air emissions related to the proposed action would be generated by construction activities on a short-term basis, and from LBL vehicles and the operation ventilation systems on a long-term basis. Construction operations would be performed in a manner to limit vehicle-trips and the amount of dust generated as described in Section 4.7, Air Quality. With identified measures, neither construction vehicle exhaust nor dust generation would create a substantial impact on air quality. Additionally, operational air emissions from the existing facility currently do not constitute a significant impact to air quality. Since operational air emissions would not increase with the development of the replacement HWHF, no new air quality impacts would result.

The action would not add to the number of vehicular trips generated by HWHF operation nor would it alter the route of vehicles carrying waste off-site. The transportation of hazardous waste materials to the replacement HWHF would be along private roads within the limits of the LBL site. The removal of hazardous waste handling operations from their present location would improve traffic circulation on the LBL site by relieving congestion at the Shop and Facilities Support Area. Short-term impacts to traffic from construction vehicles would not have a substantial effect on the management or operation of the LBL site.

Noise generation would increase in the vicinity of the construction site during the construction of the proposed HWHF. Trucks transporting excess earth material for landfill disposal would cause higher noise levels on the haul route. However, the short-term increase to noise generation, including noise generated by transport vehicles, is not expected to create a significant impact in the project vicinity or on a haul route. Operational noise at the facility would be generated primarily by vehicles or trucks accessing the replacement HWHF and would not cause a significant impact.

Hazardous waste management and the possibility of accidental release of hazardous substances during HWHF operation are evaluated in Section 4.10 of this assessment. As noted in this section, operation of the proposed facility would not produce adverse health impacts. The project is designed to reduce potential impacts to human health and the environment from upset conditions. Design features and safety procedures employed at the facility would mitigate potential adverse impacts from accidents. Improvements in hazardous waste handling processes and the construction of a specially designed facility would enhance environmental safety for hazardous waste handling operations.

Construction of the replacement HWHF would not create any adverse socioeconomic impacts to population, housing and employment, nor would it produce a substantial new demand on utilities or services. The existing facility will be subject to RCRA clean closure requirements, and the radioactive material and chemical controls cited in Chapter 2. Table 3-1 lists the environmental impacts associated with the proposed action and measures to reduce adverse effects.

TABLE 3-1

SUMMARY OF IMPACTS

	Impact	Discussion
4.1	**LAND USE AND PLANNING**	
4.1-1	The action would introduce a planned new function to the proposed site.	The proposed action would be consistent with the LBL LRDP and would not conflict with other plans, or goals, or established land uses.
4.1-2	The action would release existing HWHF areas for alternative future uses.	Released space would help LBL attain long-term land use and planning goals and would be a beneficial effect of the action.
4.2	**CULTURAL AND HISTORICAL RESOURCES**	
4.2-1	During construction, previously undiscovered evidence of cultural or historical value could be discovered.	If archaeological resources, materials, or artifacts are uncovered during grading or construction at the site, work in the area would be halted and an archaeologist retained to survey findings and recommend appropriate actions, including notification of the State Historic Preservation Office. If unknown human burial sites of Native American groups are discovered, an appropriate representative of Native American groups and the County Coroner would be informed and consulted as required by State law.
4.3	**VISUAL QUALITY**	
4.3-1	The proposed building, yard areas, and access road would introduce new visual elements into the visual environment of the site vicinity.	A low-profile structure would be constructed that would be set back into the existing vegetation and landscape. The color of external building elements would be muted in tone to harmonize with surrounding elements. Severe angular cuts and/or filling which results in an unnatural or engineered appearance would be avoided by using feathered and rounded graded slopes where feasible to provide a natural transition between the graded site and adjacent ungraded areas. Grading would be minimized through the use of retaining walls with proper design.

	Impact	Discussion
4.3-2	Views of the proposed site from some points in the immediate vicinity and from Grizzly Peak Boulevard turnouts would be altered.	Landscaped buffering would be provided between new construction areas and adjacent buildings and roads to screen views and to diminish potential visual intrusion. New landscaping would utilize native materials and be arranged informally. Plants would be "deer resistant" or protected from browsing animals until well established. The exterior storage yard, generator and ancillary equipment area would be fenced and visually screened.
4.3-3	The action would remove outdoor storage areas from the visual environment of the existing HWHF vicinity.	Any residual building materials or other remnants of the existing HWHF activities would be removed from the Shop and Support Facilities Area after the transfer of operations to the replacement facility.
4.4	**VEGETATION AND NATURAL RESOURCES**	
4.4-1	The action would result in the removal of existing vegetation at the proposed site, including approximately 37 native trees.	Disturbed areas not covered by improvements (e.g., structures, hard surface) would be hydroseeded after the completion of grading. The site would be revegetated according to the landscape plan prepared by the retained A/E firm. Areas disturbed during construction would be revegetated with fire-resistant and native plant species to the maximum extent feasible. Cut, fill, and land grading would be conducted in a manner to minimize tree removal and injury to mature trees. The roadway alignment would be used in the design of fire breaks for the site to minimize the removal of vegetation.
4.5	**GEOLOGY, SOILS AND SEISMICITY**	
4.5-1	Site excavations and grading could create unstable earth conditions on-site that could pose a hazard to construction personnel and equipment.	Temporary and permanent altered slopes on-site would not exceed the maximum height and topographic ratios recommended by the geotechnical engineer. Where needed, design would utilize structural retaining walls and crib retaining walls to retain soil slopes. Excavations would be shored as required by OSHA regulations to preclude trench and embankment failures during the construction period.
4.5-2	Proposed site areas disturbed by construction activities could be subject to short-term and long-term erosion.	Construction would be performed according to the Association of Bay Area Governments (ABAG) standards regarding erosion control.

	Impact	Discussion
		Construction would incorporate recommendations from the geotechnical report regarding erosion control.
		Disturbed areas would be replanted as soon as feasible after the completion of grading. Plantings would be used on surfaces of cut and fill areas to collect surface runoff and reduce erosion. A landscape maintenance program would be conducted.
4.5-3	Facility elements could be subject to damage from failure of the fill resulting from improper surface or subsurface drainage, compaction, or composition.	Design specifications for foundations of the proposed structures and engineering fill would conform to recommendations made by the California registered geotechnical engineer retained by LBL.
		Benched keyways, subdrains and culverts would be utilized as necessary to eliminate the effects of the subsurface conditions, along with building foundations designed to resist the designated vertical and lateral loads.
4.5-4	Earthquake groundshaking at the site could cause structural damage and subsequent hazard to building occupants. Non-structural elements, such as shelving, cabinets, bookcases and light fixtures, could become hazards to facility occupants.	The capability of the new facility to resist earthquake-induced ground motion would be ensured by compliance with the Uniform Building Code, DOE building design criteria (Order 6430.1A), and LBL standards.
		Shelving, cabinets, bookcases and light fixtures would be securely bolted to walls and other structural elements according to LBL policy.
4.6	**HYDROLOGY AND WATER QUALITY**	
4.6-1	Construction activities could cause erosion at the site and subsequent water quality degradation and/or reduction of storm drainage system capacity.	Erosion control measures cited in Section 4.5, Geology, Soils and Seismicity would apply to mitigating potential water quality and storm drainage system effects. In addition, temporary stilling basins would be constructed to trap sediment and prevent it from leaving the site in storm water or washwater runoff.
4.6-2	The project would alter existing drainage at the site and would increase the amount of storm runoff from the project site.	The project would be constructed with adequate drainage facilities to collect storm water runoff from roofs, sidewalks, parking lots and other hard surfaces, and deliver it to existing channels of adequate capacity to accommodate the flow.

	Impact	Discussion
		To alleviate potential erosion impacts on the lower reach of the ephemeral stream, the proposed storm drainage facility would be designed to reduce the velocity of post-construction runoff by constructing energy dissipaters, such as rip rap.
4.6-3	The potential for a hazardous waste spill that could affect water quality would exist from continued handling operations.	The facility would be designed in conformance with the regulations of RCRA and DOE 6430.1A to secure the loading and storage areas and to prevent contamination of the surrounding environment during an accidental spill of hazardous materials. Containment features would be provided as described in Chapter 2, Description of the Proposed Action. Underground fuel storage or waste tanks located at the facility would conform with the California Underground Storage Tank Regulations and would be installed to satisfy the requirements of EPA, the City of Berkeley Toxics Management Program, and the San Francisco Bay Region RWQCB.
4.7	**AIR QUALITY**	
4.7-1	Construction activities would create short-term increases of dust emissions at the site and of exhaust emissions from vehicles related to construction.	Dust emissions related to excavation and construction would be reduced by watering. The frequency of watering would increase as wind speeds increase. The project site would be cleaned daily of mud and dust carried onto street surfaces by vehicles during construction. Measures noted in Section 4.5, Geology, Soils, and Seismicity related to erosion also would apply to reducing dust emissions. Upon completion of construction, replanting and paving would be completed as soon as feasible.
4.7-2	Operation of the facility would continue to involve the generation of low levels of air emissions of radionuclides.	HEPA filters and in-line samplers would be provided to reduce emissions of radioactive materials and to monitor exhaust air from radioactive handling areas. Air emissions would be maintained below threshold levels determined by statutory requirements.

	Impact	Discussion
4.8	**TRAFFIC AND CIRCULATION**	
4.8-1	Trucks transferring wastes would continue to access public streets and highways.	The operation of transfer trucks would continue to be conducted in compliance with all applicable State and federal regulations including Title 49 CFR 397.9 and Title 26 of the California Vehicle Code.
4.8-2	The project would remove some vehicular congestion at the existing HWHF site and facilitate access to the Shop and Facilities Support Area.	This is considered a beneficial impact of the proposed action.
4.8-3	The project would include construction of an access road to serve vehicles transporting hazardous wastes.	Design of the access road would comply with the Caltrans Highway Design Manual.
4.8-4	Construction would create short-term increased vehicle traffic at LBL and on City access roads.	The construction contract would strongly urge carpooling to limit the number of vehicle trips per day and to reduce parking demand.
4.9	**NOISE**	
4.9-1	Construction would create increased short-term noise levels at the adjacent Buildings 83 and 74 area, and along the routes used by construction vehicles.	Construction equipment, including construction vehicles transporting materials on- and off-site, would be fitted with sound suppressant devices to control noise volumes to the degree shown feasible in Table 4-2.
4.9-2	Facility operation would involve exhaust fans and periodic tractor trailer trips that would elevate noise levels in areas adjoining the site.	Noise suppression features would continue to be maintained on transfer vehicles. Exhaust fans would be contained in a mechanical penthouse that would reduce noise emission.
4.10	**HAZARDOUS MATERIALS**	
4.10-1	Improper handling of hazardous wastes could create a hazard to HWHF personnel or the environment.	An ongoing training program to instruct and update EH&S Department personnel and facility staff on the handling of hazardous materials would be continued at the new facility. Training and handling procedures would be performed in accordance with established regulations and programs as at the existing facility. All handling activities involving transfer of hazardous wastes would continue to be conducted using fume hoods and glove boxes as required.

	Impact	Discussion
		A comprehensive regulatory review and environmental audit routinely administered for the existing facility at LBL would be continued at the proposed facility.
		An existing monitoring program to sample soil and groundwater conditions at LBL would be extended to include the new facility. The monitoring program would be consistent with federal- and State-mandated environmental regulations. Sampling locations appropriate to the site would be identified when final design plans are complete.
4.10-2	Containment and safety features at the replacement HWHF would improve environmental and health protection over existing conditions.	This is considered to be a beneficial impact of the proposed action.
4.10-3	Upset conditions could cause a spill or discharge of hazardous materials related to HWHF activities.	Facility design would include features to contain potential spills such as concrete diked floor areas with chemical-resistant surfaces and sloped, valved yard areas.
		HEPA filters and in-line samplers would be installed to control and detect the release of unauthorized quantities of radioactive particulates.
		An emergency generator would be installed at the facility to ensure safe operation in the event of a power failure.
		An existing emergency communication system including the LBL Fire and EH&S Departments would be extended to new facility to allow immediate response by appropriate authorities and LBL personnel in the case of an emergency situation.
		An emergency evacuation plan for the site would be incorporated into the LBL Master Emergency Plan. The plan would instruct staff on measures to be taken in the event of a fire, earthquake or occupational mishap.

4.11 UTILITIES AND SERVICES

Fire Protection

4.11-1	Accidental fires could occur at, or around, the proposed facility.	The proposed project would be designed and constructed to meet all applicable fire safety codes and standards.

	Impact	Discussion
		New landscaping would be pruned and cut back on a routine basis to prevent a build-up of vegetation at the perimeter of facility structures. The 34-foot wide access road included in the action would serve as a firebreak between the facility and surrounding natural vegetation. The waste handling facility would be equipped with an automatic wet sprinkler system, fire alarms and smoke detection devices. The detection and alarm systems would be consistent with LBL Standard Specification 16721.
4.11-2	The action would remove dense underbrush and eucalyptus trees and would utilize less fire-prone landscaping vegetation and arrangement.	This action would reduce the danger of uncontrolled fire in the site vicinity.

3.2 ALTERNATIVES TO THE PROPOSED ACTION

LBL conducts operations within a 130-acre site served by contiguous roads and utility systems. Site selection for scientific and support facilities is a continuing process at LBL. Planning efforts are conducted by a staff of engineers, architects, planners and consultants.

The LBL site is organized into seven functional planning areas. LBL has identified sites for replacement buildings in four of the seven areas as indicated in Figure 3-1. Buildings on the LBL site house programmatic or support activities that maintain essential Laboratory functions.

Three alternatives to the proposed action were considered. These are: 1) No Action; 2) Remodel Existing HWHF; and 3) Alternative Site Location.

3.2.1 NO ACTION ALTERNATIVE

The "No Action" alternative would continue hazardous waste handling at the existing facility, Building 75A, adjacent to Buildings 69 and 75. HWHF operations also would remain in two rooms of Building 75, in the storage area adjacent to Building 69, and in the Building 75 yard area. The existing fenced service area for the facility is adjacent to Building 75A. Primary access and circulation is between Building 75A and Building 75.

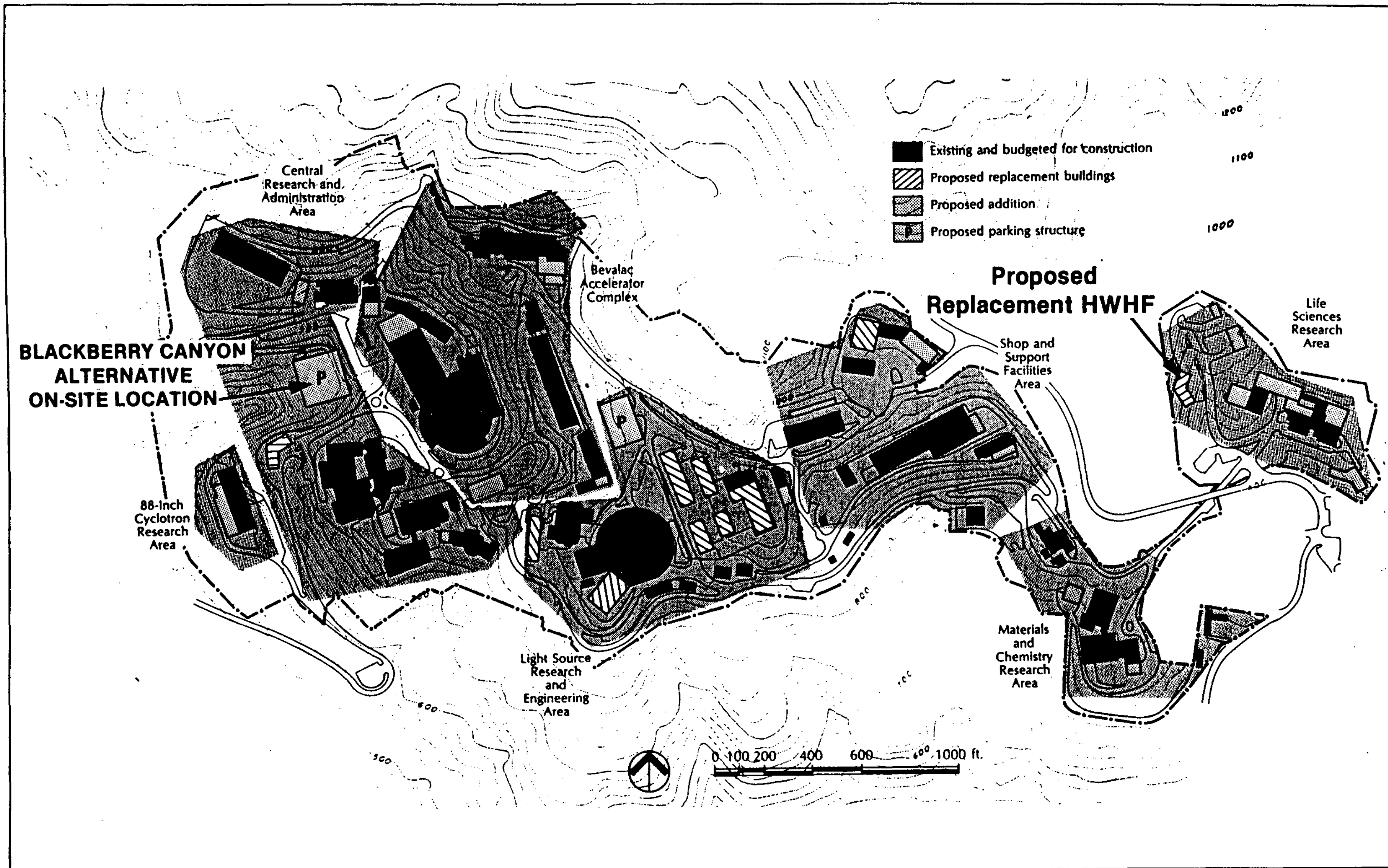
The "No Action" alternative would allow existing operations similar in scope and content to the proposed replacement facility to continue at the existing site, but under congested, crowded and less-efficient conditions. Truck access to this site is along approximately one mile of serpentine roads. During commute hours, additional access is provided at the Strawberry Canyon Gate. Hazardous wastes are delivered in small quantities to the facility from various locations on a routine basis. Marked pickup trucks with lockable storage containers transport materials to the facility. Materials are then segregated and prepared for shipment in 55-gallon drums. These materials are held in storage until an adequate load for off-site shipment accumulates. The "No Action" alternative, like the proposed action, would not involve incineration.

<u>Environmental Impacts</u>

The "No Action" alternative would not meet the LBL management's objectives of reducing congestion in the vicinity of Buildings 75 and 69, and of relocating hazardous waste handling from

POTENTIAL ALTERNATIVE ON-SITE (LBL) LOCATIONS

FIGURE 3-1



SOURCE: LBL LONG RANGE DEVELOPMENT PLAN 1987

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a congested area to a more efficient facility at a less crowded location. Projected improvements to the efficiency of waste handling operations would not occur if the "No Action" alternative were implemented. Traffic congestion would not be reduced, and future consolidation of materials supply and storage functions in the Building 75 and 69 areas could not occur. Consolidation of functions and the orderly planned restoration of the center of the LBL site, including the relocations of supply services facilities, would also not occur. The "No Action" alternative would not comply with the LBL LRDP.

The "No Action" alternative is within the Strawberry Creek watershed as is the proposed action, but drains a separate sub-watershed. The "No Action" alternative would not modify existing runoff patterns at the LBL site nor modify any existing vegetation or wildlife resources. In addition, the "No Action" alternative would maintain the existing visual quality of the site, and would not result in changes to existing structures, land forms and landscaping, or in light or glare impacts.

The "No Action" alternative would maintain congested conditions in the receiving, shipping and materials handling areas of LBL and the building areas where health and safety staff and functions are maintained. The existing facility is adjacent to office buildings (Buildings 69 and 75) and pedestrian and vehicle circulation routes. The proposed action would relocate operations away from these facilities and activities. The "No Action" alternative could contribute to traffic conflicts associated with handling wastes and hazardous materials in an area of extensive vehicle and pedestrian circulation, and an area frequented by drivers and vendors who may not be familiar with LBL site layout and operations.

The "No Action" alternative would not contribute to additional noise from construction or operations. Noise from existing operations is not significant. Existing vehicle noise does not affect existing waste handling operations. The "No Action" alternative would not modify existing utilities or affect economic or cultural resources.

The existing facility is operated under applicable licensed procedures and safety regulations. Normal facility operation would not result in adverse human health effects. In the event of an accident, fire or earthquake, the release of some hazardous materials may occur. The "No Action" alternative would not allow for a specially-designed facility with improved containment and safety features.

3.2.2 REMODEL EXISTING HWHF

A possible alternative to the proposed action would be to remodel the existing HWHF. Working areas would be expanded in this alternative by building a larger structure on the same site as the existing HWHF Buildings 75 and 75A. Safety would be enhanced by replacing the existing containment features with specially designed features such as those planned for the replacement HWHF. Rebuilding the existing HWHF to the specifications of the proposed replacement facility would require extensive reconstruction to the existing facility.

Construction for an improved existing HWHF would involve discontinuing operations at the facility and transferring equipment and stored materials to another site while construction and remodeling proceeds. However, LBL requires continuous hazardous waste handling services and, since no interim facility currently exists at LBL, another facility would need to be built to conduct handling operations. Creating a temporary handling hazardous waste handling facility in order to improve the existing HWHF would involve substantial construction impacts and costs beyond those associated with the construction of a permanent replacement facility alone.

Environmental Impacts

Remodeling the existing HWHF would not allow for compatible land uses in the vicinity of the existing site because hazardous waste handling would continue to be performed in a congested area of the LBL site. The objective of land use compatibility associated with the proposed action, a goal expressed in the LBL LRDP, would not be achieved through development of the remodel alternative. Improvement of the existing HWHF would not differ from either the proposed action or the existing HWHF in terms of demand for utilities and services or in effects on socioeconomics (i.e., population, employment and housing) or historical and cultural resources.

Visual quality of the existing site could be improved by development of this alternative. Existing structures could be replaced with a permanent building designed to blend with the existing site elements. The alternative would not remove the storage and loading areas, however, which are not considered to contribute to the visual quality of the existing site.

Remodeling would not create impacts on vegetation and wildlife because it would utilize the existing HWHF site. No new adverse geologic effects would occur, and site hydrology would not be affected. By comparison, the proposed relocation of the HWHF would create some impacts on the geology and hydrology of a currently undeveloped site. Neither the proposed action nor this alternative would create new long-term impacts to air quality.

Construction activities would occur in a more congested area of LBL than the site of the proposed action and temporary traffic and noise impacts therefore would be greater. In contrast to the proposed action, this alternative would not reduce traffic congestion in the receiving and shipping areas of LBL. Remodeling, like the proposed action, would supply specially designed safety features at the HWHF and provide additional working area to relieve crowded conditions.

3.2.3 ALTERNATIVE SITE LOCATION

This alternative discusses environmental impacts associated with construction and operation of a replacement hazardous waste handling facility at a location other than the proposed site. The following criteria were used to identify sites for analysis as off-site development alternatives:

1. The site must be located in the immediate vicinity of LBL hazardous waste generator sources to maximize efficiency and to minimize potential transport hazards.

2. The site must minimize potential circulation conflicts and must include appropriate access for large trucks and adequate circulation for forklift equipment.

3. The site must be, or be capable of being, stable and flat, and must be large enough to accommodate a minimum of 6,000 gross square feet (GSF) of storage and material transfer/staging area and an approximately 12,000 GSF building for hazardous waste handling functions.

Based on these criteria, several alternate LBL sites were considered. Undeveloped sites and building replacement sites within the LBL property plan for development are described in LBL's 1987 LRDP and associated EIR (see Figure 3-1). All of the undeveloped sites at LBL were examined for the possibility of siting the replacement HWHF and were found to be less suitable for waste handling purposes than the proposed site in the Life Sciences Research Area. With the possible exception of the Blackberry Canyon site, the remaining undeveloped and replacement sites at LBL are in close proximity to existing activities and would be unsuitable for the HWHF because of congested circulation and access and would not meet the space requirements for the facility's building size and associated paved areas for loading and unloading vehicles.

The Blackberry Canyon site is the only location at LBL, other than the proposed site, that meets the requirements for the HWHF. This alternative site is located in the LBL Central Research and Administration Area as indicated on Figure 3-1.

Environmental Impacts

In general, this alternative site would meet the action's objectives. However, as described below, the proposed site has been determined to be environmentally superior to this site, especially in the areas of land use and geology.

The Blackberry Canyon site would have visual impacts similar to the proposed action. This location would be partially visible from outlooks on Centennial Drive and from other surrounding areas. Like the proposed action, the building would be designed to conform with the site topography, and would have a similar site layout and landscaping plan. Building colors and roof treatments would be selected to blend with the surrounding site. Development of the Blackberry Canyon site would have less impacts on vegetation, wildlife, and hydrology than the proposed site because it is already paved. Site preparation would require a minimal amount of removal of trees and other vegetative habitat for LBL wildlife. Although this area of the LBL property contains both the drainage area and stream bed of Blackberry Creek, development of the facility on this site would not have significant impacts on hydrology since the site is currently paved.

Development of the HWHF at this alternative site would have more geologic and seismic impacts than the proposed action. The walls of the canyon on both the north and south sides of the Blackberry Canyon site are prone to shallow surface slides. The location is approximately 700 feet from the Hayward Fault zone and therefore has a higher probability of severe ground shaking in the event of a major earthquake. Further, the existing parking lot at the site was constructed about 40 years ago on non-engineered landfill approximately 60-120 feet deep. The combination of the slide potential of the surrounding canyon walls, the close proximity to the Hayward Fault zone, and the existing non-engineered landfill conditions create substantially more geologic and seismic hazards than the proposed site.

Development at this alternative site has similar traffic impacts, but more parking impacts, than the proposed action. Development at the alternative site would not change the patterns to or from LBL or the number of vehicle trips on the surrounding street network. However, the Blackberry Canyon site is the largest existing parking lot at LBL and its removal would cause significant parking impacts since parking is currently inadequate to meet current demand or planned future demand.

The noise and air quality impacts of this alternative would be similar to the proposed action.

Development and operation of the HWHF at any alternative location would be performed under applicable licensed procedures and safety regulations. As discussed in Section 4.10, normal HWHF operations would not result in any adverse effects on human health. The Blackberry Canyon site would, in general, not differ from the proposed site in terms of needs for utilities and services or any effects on socioeconomics, historical and cultural resources.

Other Alternative Sites

Consideration was given to developing a replacement HWHF at a location off of LBL property. The most likely locations for a new facility were considered to be areas which could be leased by LBL from the University of California because of their existing institutional relationship. Two sites that were initially considered were the University's Richmond Field Station in the City of Richmond and University-leased land on 64th Street in the City of Emeryville. Uses of undeveloped areas at the Richmond site are currently being planned by the University. The Emeryville property now contains a warehouse and receiving area as well as a large paved area. After initial consideration, sites remote from LBL, including the Richmond and Emeryville sites, were not analyzed further because it was determined that the action's objectives of improving existing activities to the highest attainable standards following the best criteria for operations and facilities could not be feasibly achieved at such a location.

The Guidelines for Hazardous Waste Management Plans (HWMPs) prepared by the California Department of Health Services, 1987, state that on-site management of hazardous waste is preferred over off-site management. Although LBL is exempt from local land use regulations, LBL intends to follow the policies set forth in the Alameda County HWMP. Development of an off-site HWHF for LBL would conflict with the objectives of the Alameda County HWMP, whereas the proposed site would further the County's hazardous waste management goals of containing hazardous waste generation at the source.

The basic function of the LBL HWHF is the processing and packaging of hazardous waste for shipment to approved off-site facilities. Department of Transportation (DOT) regulations require that hazardous waste prepared for transport on routes involving public roads comply with stringent requirements. Therefore, development of an HWHF off of LBL property would not alleviate the need for an on-site HWHF unless each hazardous waste generator at LBL prepared waste for transport off-site in compliance with DOT regulations.

The additional personnel, training, supervision, and space that would be needed to perform HWHF activities in dispersed locations for transfer to a central packaging and transport site, as well as increased vehicular trips and potential effects to safety, efficiency, and planning goals, would generate greater potential impacts than the proposed action.

Summary of Alternatives

While existing normal operations should not result in adverse health or environmental effects, in the event of an accident, earthquake, or fire, the "No Action" alternative would not allow LBL to achieve efficiency and safety improvements in relation to hazardous waste handling functions. This alternative would not comply with the goals and policies of the LBL LRDP.

Similarly, the "Remodel Existing HWHF" alternative would not adhere to the goals and policies of the LBL LRDP in that land use compatibility in the HWHF vicinity would not be achieved. The "Remodel Existing HWHF" alternative, like the "No Action" alternative, would not meet the goals of improved safety related to relieving congested traffic conditions in the HWHF area, although it would allow for improved safety and containment features, and for some improvement to the visual quality of the facility. The disadvantage of this alternative is that it would require construction of a temporary facility to handle the hazardous and radioactive waste during the remodeling. The additional construction impacts of the temporary facility would make the total impact greater than those associated with the construction of a long-term replacement facility alone.

The "Alternative Site Location" alternative at Blackberry Canyon, while it would allow for improved visual quality and increase safety and containment features, would present such disadvantages as greater potential for impacts from slides on the surrounding canyon walls, and closer proximity to the Hayward fault zone and a non-engineered landfill, which would pose a serious seismic hazard. In addition, this alternative would cause adverse parking impacts by eliminating the largest parking lot at LBL.

The proposed site is substantially more stable and less congested, and offers the greatest potential for improving the efficiency and safety of hazardous waste operations at LBL.

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4. ENVIRONMENTAL ISSUES

This chapter discusses the potential environmental effects of the proposed action on various impact categories. Each section of this chapter includes a description of the existing environmental setting, identifies potential impacts of the action and identifies measures which would reduce adverse effects.

4.1 LAND USE AND PLANNING

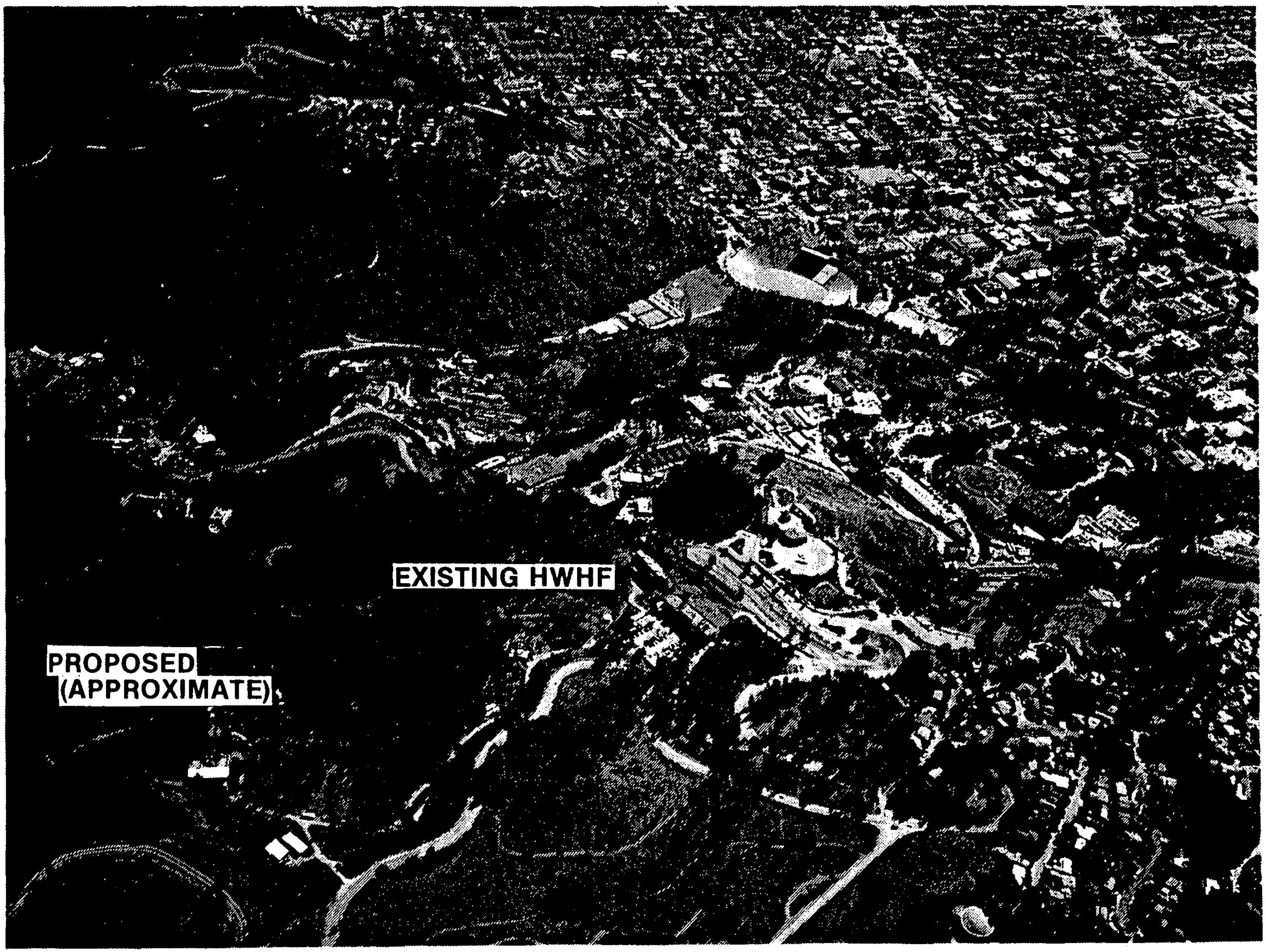
SETTING

LBL areas total 130 acres and are completely enclosed within the boundaries of the University. Of the 130 acres of LBL land, 68.3 acres are UC lands leased to DOE, 11.5 acres are occupied by LBL under an occupancy agreement with the University, and the remaining 50.2 acres are University lands controlled by LBL within the LBL fence line, but not developed. Most of this remaining undeveloped land is open space and hillside areas. Of the LBL site area, the greatest potential for future development is contained within the original site area (approximately 15 acres) and in the east site area where additional undeveloped land exists (approximately 10 acres of the Life Science Research Area).[1]

The proposed site is located in the LBL Life Sciences Research Area. Access to the Life Sciences Research Area from the west is via Cyclotron Road and a controlled security gate on Centennial Drive. As shown in Figures 4-1 and 4-2, the area that surrounds the Life Sciences Research Area includes developed areas, natural areas, and ecological study areas. Vegetation on the surrounding rugged hillsides consist of oak-bay woodland, northern coastal scrub, annual grassland, and various conifer and eucalyptus plantations. Development in the area is concentrated along Centennial Drive, and new development opportunities are constrained by topography and existing land uses.

AERIAL PHOTGRAPH OF SURROUNDING LAND USES

FIGURE 4-1



SOURCE: EIP ASSOCIATES

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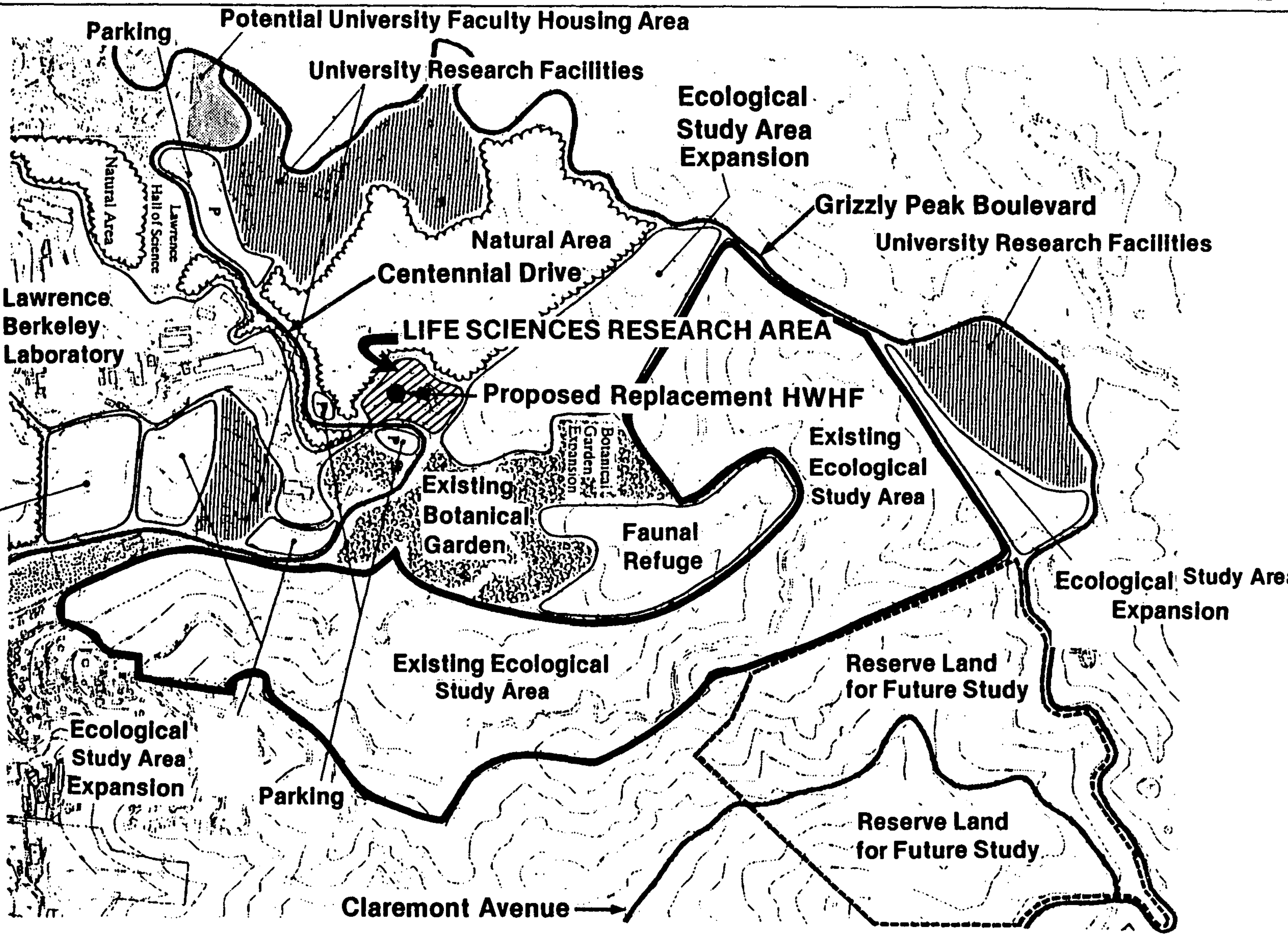
SURROUNDING LAND USE

FIGURE 4-2



SOURCE: UC BERKELEY CAMPUS PLANNING OFFICE

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Surrounding Land Uses

The LBL Biological Research Laboratory (Building 74) and the Cell Culture Laboratory (Building 83) comprise existing development within the Life Sciences Area and lie immediately to the south of the proposed site. Other adjacent land uses are related to the University as described below. Undeveloped UC-owned areas of the Strawberry Canyon drainage basin extend north and east of the site to Grizzly Peak Boulevard (Figure 4-1). This land is designated Natural Area by the 1989 UC LRDP currently in preparation (Figure 4-2). Natural areas are defined as the remaining undeveloped lands located around sites which are presently developed, designated for development or identified for future inclusion in the Ecological Study Area.[2]

As shown in Figure 4-2, the University's Botanical Garden is situated south of the Life Sciences Research Area on a 33-acre site on the west-facing slopes of Strawberry Canyon. The Botanical Garden serves instructional and public service uses. The Lawrence Hall of Sciences is about a quarter-mile to the northwest of the proposed site. This UC facility houses a science museum and curriculum development center for primary and secondary science education. The Space Sciences Laboratory and the Mathematical Sciences Research Institute, which serve research and support purposes, are located north of the site.

The nearby UC Ecological Study Area (ESA) is an area of undisturbed vegetation that provides space for instruction and research related to the natural environment. The area was established in 1969. Approximately 600 acres of land are designated for the ESA and are subject to limited use. Three hundred acres of the ESA presently are reserved as natural areas for research and instruction, and expansion of the formal boundaries of the ESA is planned as shown in Figure 4-2.

The University affirmed its support of the ESA in the Draft 1989 LRDP for the Berkeley Campus, and expects it to remain under the management of the Berkeley Campus. While an active maintenance program is not provided for most of the ESA, minimal maintenance is performed in specific locations. Maintenance areas include fire trails and pedestrian access points. Motor vehicles, other than official campus vehicles, are not allowed in the area. A faunal refuge area has been designated adjacent to the ESA for the protection of natural habitats.

Demographics

As discussed above, the proposed action would be located in an area with limited existing development. Population in the vicinity generally consists of LBL and UC staff located in the facilities listed earlier in this section. According to the 1987 LBL LRDP, LBL staff in the Life Sciences Research Area number 37, and LBL has a total main site population of approximately 2,844 staff and guests. The UC facilities in proximity to the site have the following staff assignments: Lawrence Hall of Science, 330; Space Sciences Laboratory, 75; and Mathematical Research Institute, 400. The overall population associated with the University (students, staff, visitors and vendors) is approximately 44,900. Although the action would not be located near residential areas, it should be noted that the City of Berkeley population is currently estimated to be 107,000 including persons associated with the University.

Planning Context

LBL is located in Alameda County, and both the existing HWHF and the replacement facility site are within the City of Oakland. LBL occupies land in Berkeley and Oakland leased by DOE from the University of California. As presently located, the University, including LBL, as a state agency, and DOE, as a federal agency, are exempt from local zoning and planning regulations. However, the University and LBL cooperate with local agencies in planning matters of mutual concern. For example, the Advisory Committee for the new Berkeley Campus Draft LRDP includes a member of the City of Berkeley Planning Department. Comments pertaining to this EA (for the HWHF) have been solicited from the City of Berkeley.

The Oakland General Plan designates the portion of LBL that is within Oakland as Other Institutional and Governmental. There are no land use policies that specifically address LBL in the Oakland Comprehensive Plan. LBL, including the existing and proposed HWHF sites, also is contained in the University-designated "Hill Area" planning area. However, the LBL site is not a part of the Berkeley Campus Draft 1989 LRDP. LBL operates as a separate entity from the Berkeley Campus, although both provide cooperation and mutual assistance in addressing planning issues.

LBL's LRDP was approved by the Regents of the University in 1987. The LBL LRDP is a land-use guide for the Laboratory. Among its planning objectives are to: 1) "improve support and research services through proper siting and consolidation of functions;" and 2) "ensure a safe, healthful, and attractive workplace, [and] improve access. . . . "[3] The Life Sciences Research Area, where the project would be located, was designated as a reserve site for future building development in the 1987 LBL LRDP. The LRDP (page 65) and the Institutional Plan FY 1988-1993 (pages 6-8, December 1987) call for development of a waste handling facility on the project site.

IMPACTS

This section evaluates the proposed action in terms of its potential to: 1) conflict with adopted environmental plans and goals of the region where it is located; or 2) conflict with established recreational, educational, religious or scientific uses of the area.

Environmental Plans

The action would relocate an existing LBL function to a new site within the bounds of leased space currently occupied by LBL and owned by the University. Although the facility site, located on land owned by the University, is exempt from local zoning and planning regulations, the action is consistent with the uses designated for the area in the City of Oakland Comprehensive Plan. The action is not expected to conflict with other environmental plans, such as flood control management plans, established by either the City of Oakland or Alameda County.[4,5]

The action would not conflict with planning goals for Berkeley Campus development because the LBL site, including the site of the proposed action, is not included in the Berkeley Campus Draft LRDP. Rather, development at LBL is governed by the LBL LRDP (1987). The action is consistent with the LBL LRDP and would help LBL attain long-term land use and planning goals by continuing the planned reorganization of the LBL site.

Established Uses

Implementation and operation of the proposed facility are not expected to impact the surrounding University land uses, including the environmentally sensitive ESA, or other land uses in the area. The action would not intrude into the present configuration of the ESA or any potential ESA expansion area. The ESA is located to the east and south of the site. Containment would be provided in HWHF areas where hazardous wastes would be stored and handled, thereby preventing potentially-spilled hazardous waste from causing contamination off-site, including existing ESA areas and potential ESA expansion areas. The facility design would also prevent hazardous waste from being conveyed off-site via runoff. As discussed in Section 4.10, Hazardous Materials, air releases of hazardous materials from either operations or potential accidents would not be expected to cause adverse effects in off-site areas, including ESA areas.

The facility would not create conflict with existing LBL land uses within the Life Sciences Research Area (i.e., the Biological Research Laboratory and the Cell Culture Laboratory). There are no plans for future expansion of the facility in terms of physical space or building operations and the replacement facility would not expand the volume of hazardous waste generated by LBL. The function of the hazardous waste handling facility would continue to be consistent with the existing land uses within LBL. The proposed replacement facility would continue to provide the existing level of technical and administrative support to existing functions at LBL.

Impact

4.1-1 **The action would introduce a new function to the proposed site.**

The proposed action would be consistent with the LBL LRDP and would not conflict with other plans, or goals, or established land uses.

Future Use of the Existing HWHF Site

After implementation of the Closure Plan, areas currently housing HWHF operations would be available for other uses consistent with the LBL LRDP (August 1987). Future activities planned for each of the areas are summarized below.

Building 69

The sheltered area adjacent to Building 69 would continue to be used for 55-gallon drum storage of new materials. Materials stored in drums include solvents and oil. Storage related to the existing HWHF currently occupies a small amount of rack space in approximately 700 sf of the sheltered area. This amount of drum rack space would revert to storage of materials not related to HWHF operations. Removal of the waste oil storage tank adjacent to Building 69 would free about 400 sf of area. This area currently does not have a planned future use.

Building 75, Rooms 131 and 127

Two waste handling laboratories in this building would be vacated and their contents moved to the replacement HWHF. Approximately 1,500 gsf of area would be freed for future use by the LBL EH&S Department. The building is used for administrative office and laboratory space. Future use would be consistent with administrative office use. The addition of employees or staff to Building 75 would be consistent with the provisions of the LBL LRDP (1987).

Building 75A

Vacating this building would release 4,064 gsf of existing space for other uses as noted in the LBL LRDP (1987). This site eventually would be used for a planned addition to Building 69 to house primarily offices and storage areas for laboratory support services in a 42,000-gsf Support Services Facility. The clean closure of Building 75A is part of the proposed action. The future dismantling of Building 75A and the addition to Building 69 are not part of the proposed replacement HWHF action. The future Support Services Facility addition to Building 69 would be carried out in conformance with the LBL LRDP (1987). This project would place office, laboratory, and storage areas in the vacated HWHF space. Adverse land use impacts would not be expected to result from this proposed future use. The population of the building (130 staff) and its physical characteristics (size, height, massing, bulk and location) would be designed to be consistent with the goals of the LBL LRDP. Development of the future building addition would be the subject of separate environmental review processes.

Building 75 Yard Areas

The HWHF yard areas would be released by relocation of the facility. Future plans call for this vacated yard space to provide part of the area for the development of the addition to Building 69 mentioned above. Approximately 17,000 sf are currently occupied by HWHF activities.

Other future uses of the existing HWHF areas would occur as described above. These uses would involve creating replacement space for existing LBL operations as opposed to introducing new operations. Adverse environmental effects would not be expected from the proposed future uses.

Impact

4.1-2 **The action would release existing HWHF areas for alternative future uses.**

Released space would help LBL attain long-term land use and planning goals and would be a beneficial effect of the action.

CUMULATIVE IMPACTS

The action would relocate an existing LBL function to another LBL site and release existing developed space for alternative future use. It would form part of cumulative land use development projected under the LBL LRDP (1987). Such development would not conflict with any existing plans affecting LBL or existing land uses.

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[1] Director's Office, Health and Safety Liaison, Lawrence Berkeley Laboratory, LBL Site Development Plan EIR, December, 1986.

[2] University Campus Planning Office, University of California at Berkeley Draft Long Range Development Plan: 1989-2005, revised January 1990.

[3] LBL Office for Planning and Development, Lawrence Berkeley Laboratory Long Range Development Plan, August 1987, p.vii.

[4] Phil Grubstick, Engineering Services, City of Oakland, personal communication with EIP Associates, August 7, 1991.

[5] Andreas Godfrey, Alameda County Public Works Department, personal communication with EIP Associates, August 7, 1991.

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4.2 CULTURAL AND HISTORICAL RESOURCES

SETTING

The site vicinity contains two existing buildings and a paved parking area. Landscaped areas and native or naturalized vegetation are the predominant elements in the area of the proposed action. The site forms part of the Strawberry Canyon drainage system, which provides the main natural drainage channel in the area.

A review of the data on file with Archaeological Resource Service, an archaeological consulting firm, was performed by consultants to the University in 1982 for the UC Biological Sciences Alteration and Construction Project. The review revealed that three prehistoric sites are known to exist at or near the University. The closest of these sites is at UC Memorial Stadium, about one-half mile from the Life Sciences Research Area.[1] A check of the file for the LBL LRDP EIR (1987) indicated that no new archaeological sites had been reported since the 1982 review.

Most if not all areas within the LBL site that would have been suitable for prehistoric occupation and/or use have been disturbed by existing development. The most likely area within LBL to have contained evidence of prehistoric human occupation or use is the area currently occupied by Building 6. No cultural or historical resources have been identified in the site vicinity.[2,3]

In the last century, the upper Strawberry Canyon was used for cattle grazing. This use continued up to the 1930s. Since the turn of the century a continual process of change in the landscape has converted the area from open grassland to stands of eucalyptus and oak-bay woodland. A check of the U.S. Geologic Survey (USGS) San Francisco and Concord sheets from the year 1899 made for the LBL LRDP EIR (1987) indicated that no structures were located within the LBL area at that date.[4]

Within the Life Sciences Research Area, an abandoned rock quarry is located adjacent to a parking area. A cistern at the bottom of the quarry was reportedly used to supply water to Berkeley in the last century.

IMPACTS

This section evaluates the action's potential to "disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group: or a paleontological site except as a part of a scientific study." State law outlines procedures appropriate for the protection and preservation of such resources (14 CCR Section 15000 et. seq.).

Impact

4.2-1 During project construction, previously undiscovered evidence of cultural or historical value could be discovered.

The proposed action would not impact any known cultural resources, including archaeological sites. The action would not affect identified historic buildings or architectural resources. It would not impact the abandoned rock quarry or the potential historic value associated with early water supply facilities. No impacts on cultural or historical resources are expected as a,result of the action.

If archaeological resources, materials, or artifacts are uncovered during grading or construction of the site, work in the area would be halted and an archaeologist retained to survey findings and recommend appropriate actions in accordance with standard practice and applicable regulations, including notification of the State Historic Preservation Office. If unknown human burial sites of Native American groups are discovered, an appropriate representative of Native American groups and the County Coroner would be informed and consulted as required by State law.

CUMULATIVE IMPACTS

No cumulative impacts to cultural or historical resources are expected to result from the proposed action.

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[1] "Final Environmental Impact Report for Engineering Center Building," prepared by the UC Berkeley Department of Facilities Management with the assistance of Ecological Impact Studies, Inc., July, 1977. See Appendix H, p.1, "Preliminary Archeological Reconnaissance," prepared by Archeological Resource Service.

2 Ibid.

3 The Regents of the University of California, Lawrence Berkeley Laboratory, Site Development Plan, Draft Environmental Impact Report, December 1986.

4 Ibid.

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4.3 VISUAL QUALITY

SETTING

The proposed site is set in the Life Sciences Research Area of LBL. The Berkeley Hills surrounding the site consist of steep hills, woodland, open grass areas and hiking trails. Slopes in the site vicinity vary from moderately steep (8-15 percent) to steep (15-25 percent). Steeper slopes (above 25 percent) are found north of the site and below Grizzly Peak Boulevard, which reaches an elevation of about 1,300 feet (Figure 4-3).

The immediate vicinity of the proposed site contains two existing buildings and associated storage areas, access roads and surface parking lots (Figure 4-4-A). The buildings are modern in style and are one to two stories in height (Figure 4-5-A). Mechanical equipment on roof tops is screened from view by five-foot high fences.

The proposed facility would occupy undeveloped land. The site is located on a hillside which supports brushland, a stand of mature eucalyptus trees, and some oak and bay trees. Some introduced conifer plantings are used as landscaping elements near Centennial Drive. Figure 4-4-B is a key to site photographs and Figures 4-5-B and 4-5-C illustrate the existing visual character of the site. A description of the physical characteristics of the proposed building is contained in Chapter 2, Description of the Proposed Action.

The existing HWHF is a prefabricated structure set on paved surface with adjacent storage yards. The building and yards are not considered to add to the visual quality of the Shop and Support Facilities Area where the existing facility is located (Figure 4-6-B).

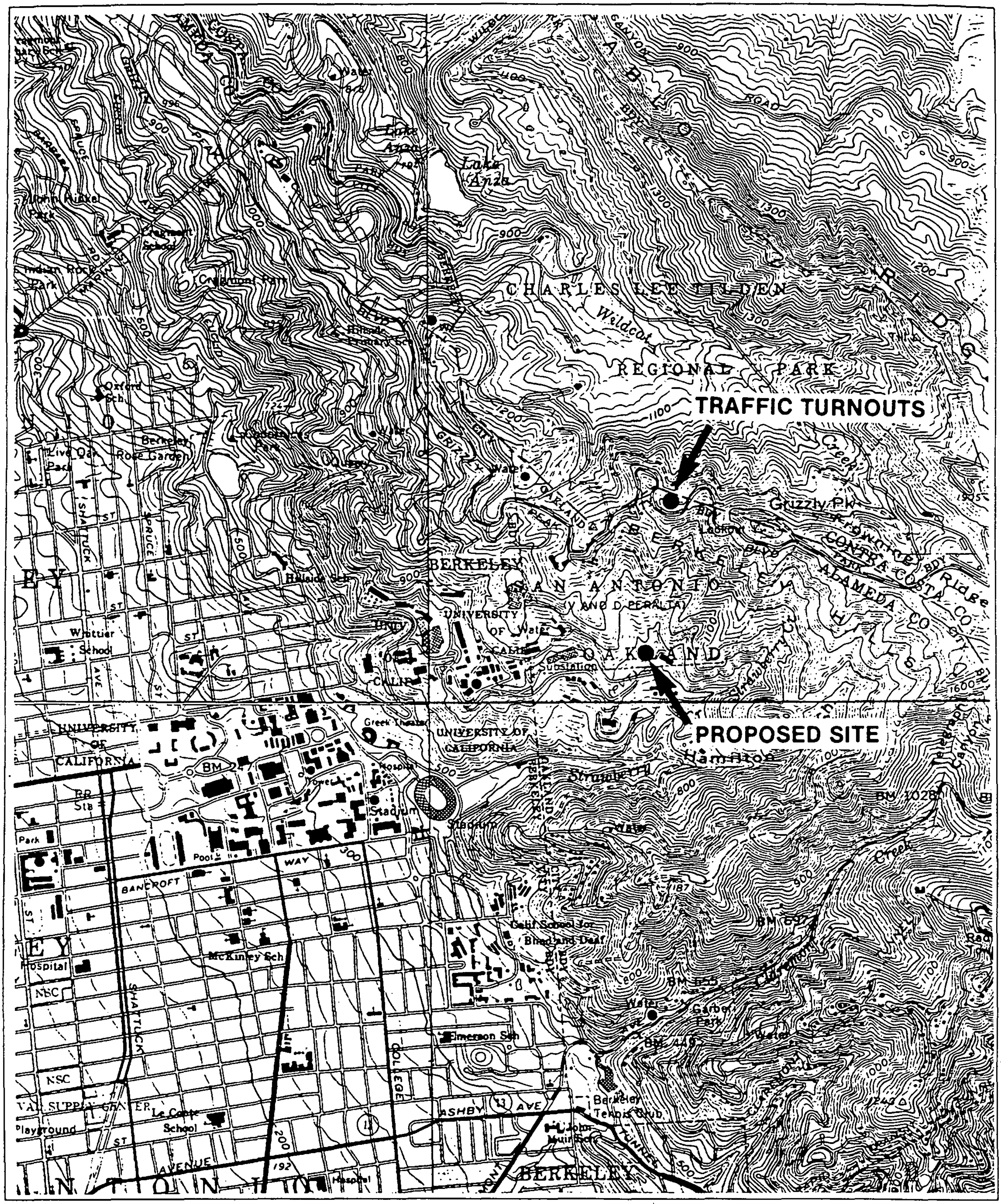
<u>Views</u>

Views from the proposed site are either partially or completely screened by on-site vegetation and by existing hillsides. The wooded hills and vegetated slopes of Strawberry Canyon can be seen from the site. The tops of some structures associated with other LBL facilities are visible across Centennial Drive from parts of the Life Sciences Research Area.

The proposed project site may be viewed from some vantage points around the existing buildings in the Life Sciences Research Area. Views of the site are extremely limited, however, because of

TOPOGRAPHIC MAP OF SITE VICINITY

FIGURE 4-3



SOURCE EIP ASSOCIATES

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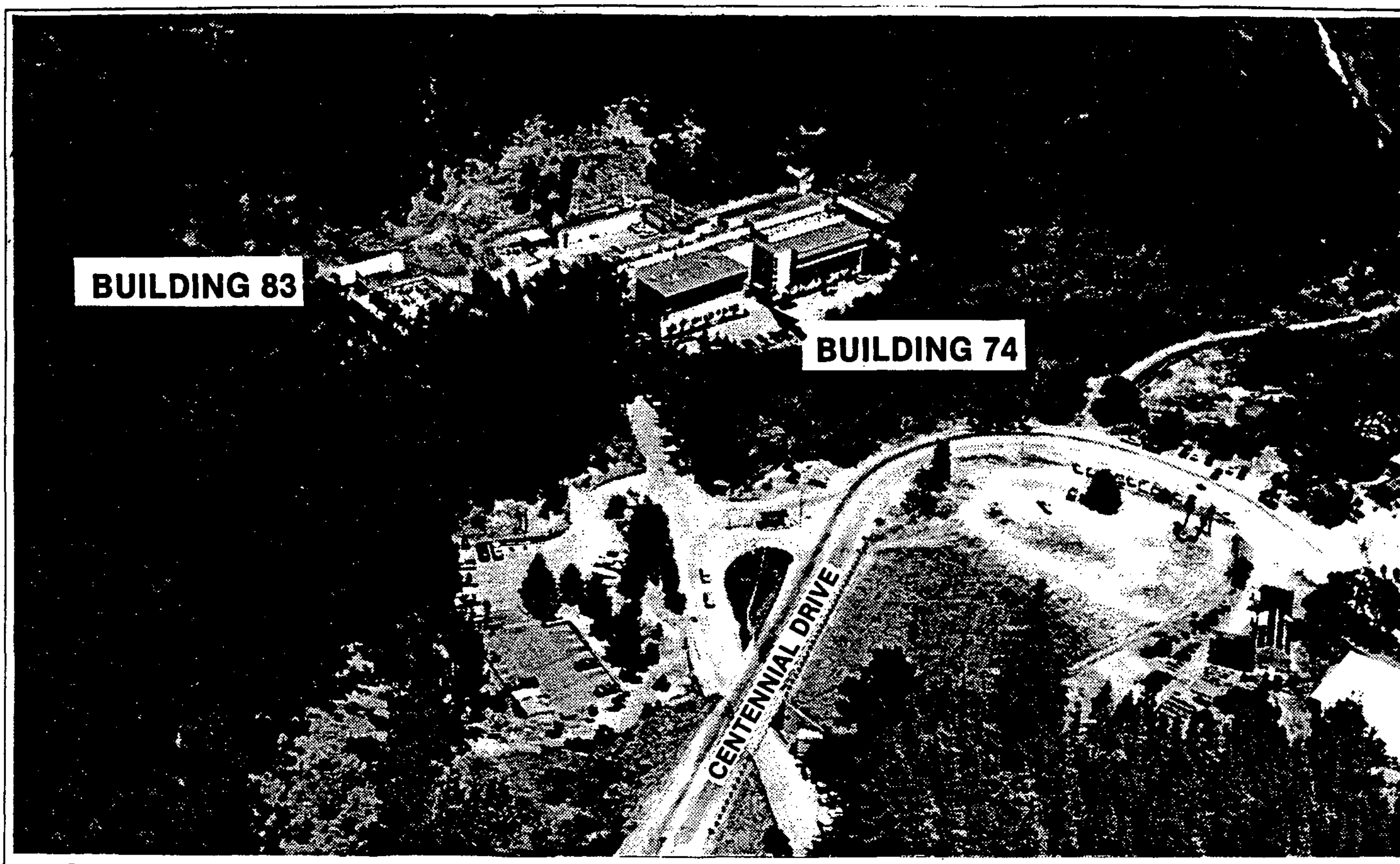
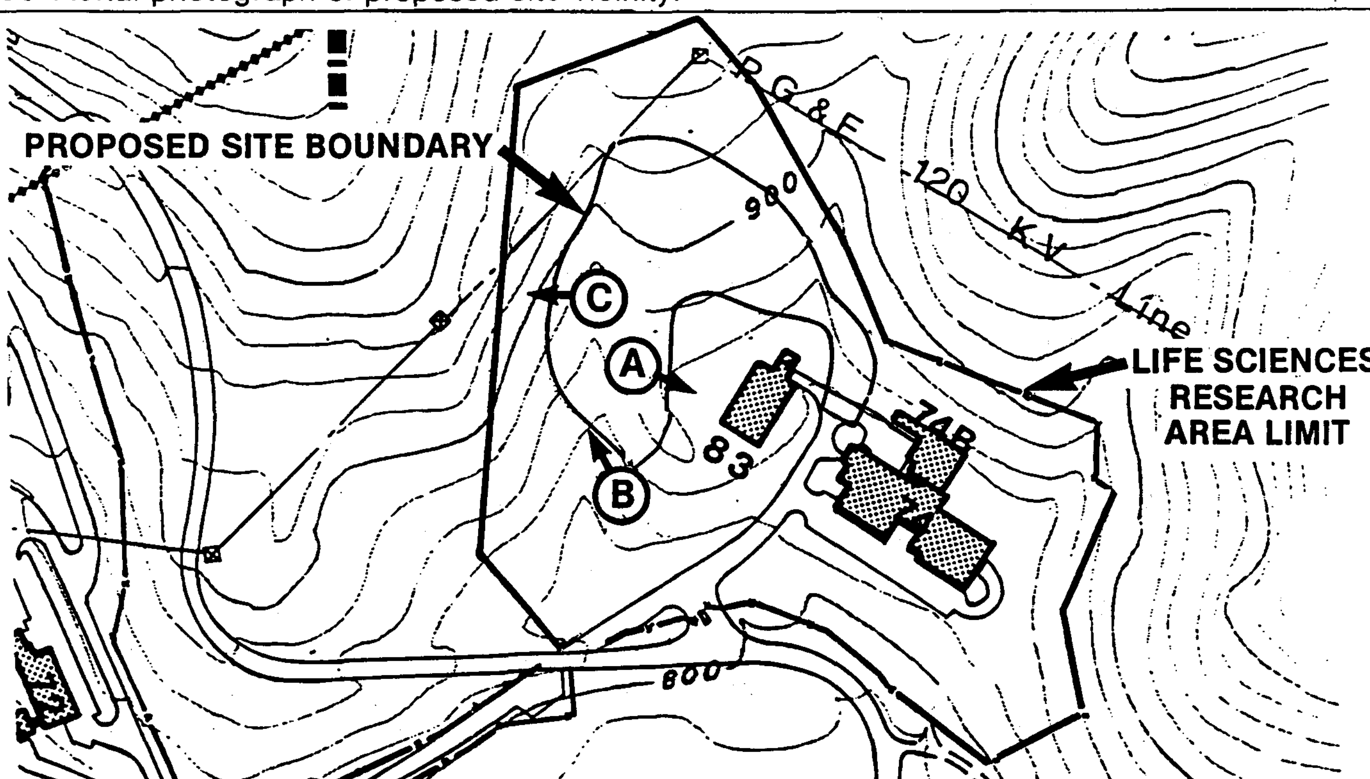
AERIAL PHOTO OF SITE AND KEY TO SITE PHOTOS — FIGURE 4-4



A Aerial photograph of proposed site vicinity.



B Key to site photographs (Figure 4-5 **A, B,** and **C**)

SOURCE: EIP ASSOCIATES

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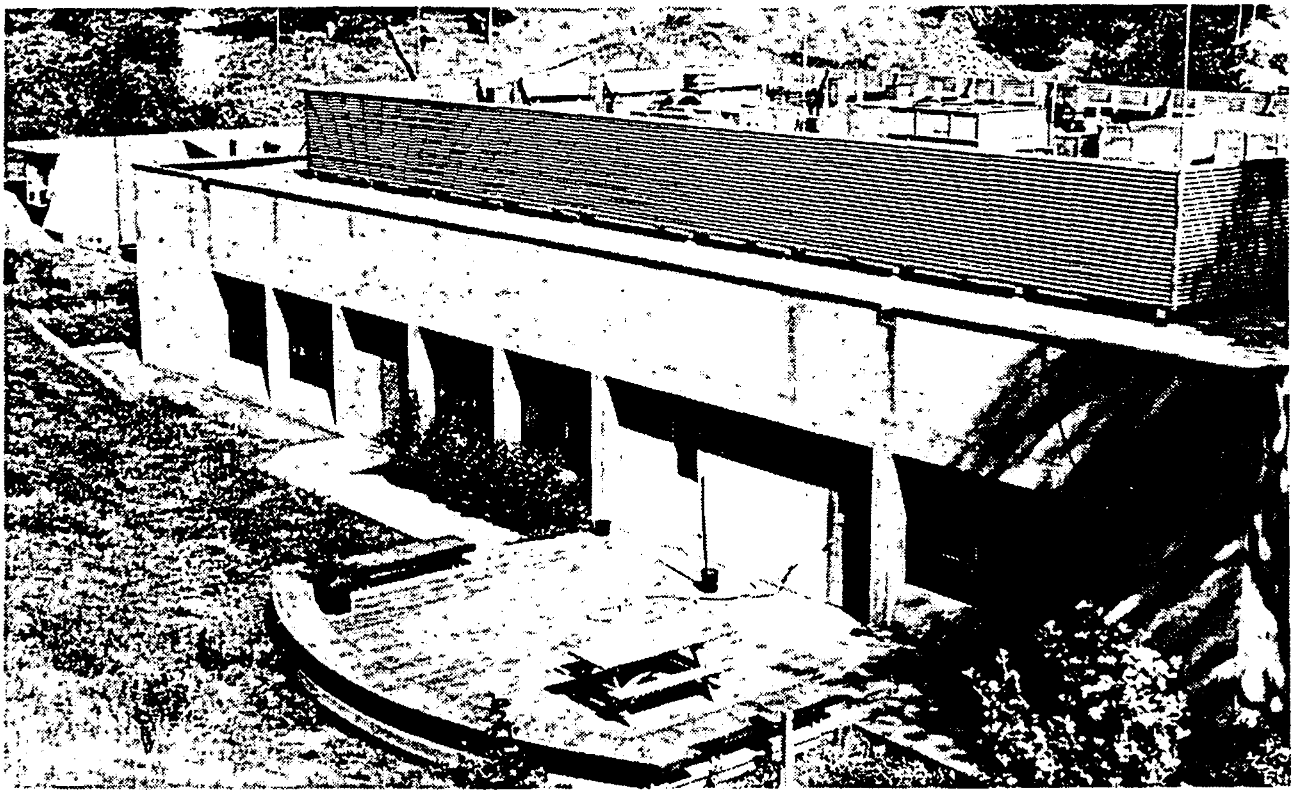
SITE PHOTOS

FIGURE 4-5



A. Uncluttered architecture and equipment screening are typical of Buildings 83 and 74.

B. The site contains stands of Eucalyptus trees.

SOURCE: EIP ASSOCIATES

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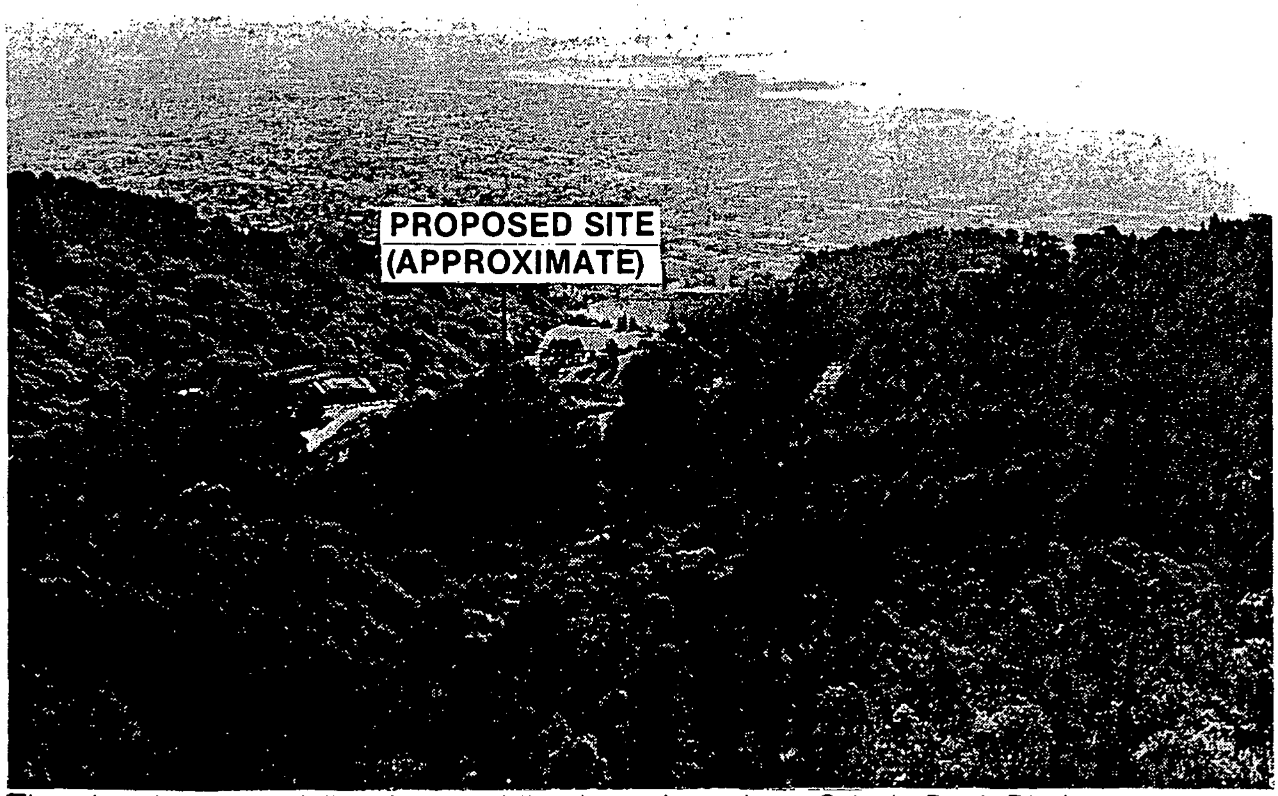
C. Steep slopes and tree cover typify portions of the site.



D. The site vicinity is visible from public viewpoints along Grizzly Peak Blvd. Panoramic views to the south and west are obtained from this vantage.

SOURCE: EIP ASSOCIATES

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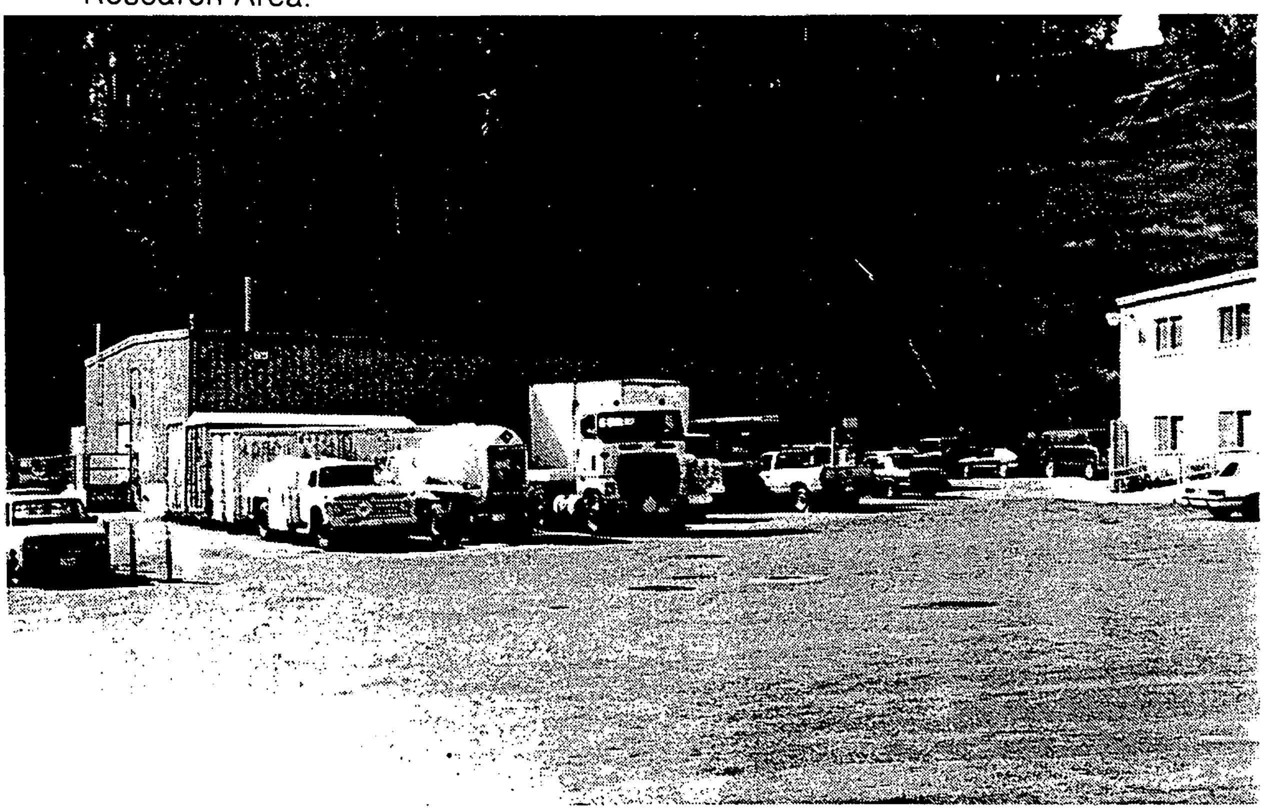
A. Vegetation screens the proposed site from the entrance to the Life Sciences Research Area.



B. The existing HWHF, Building 75A, which would be closed.

SOURCE: EIP ASSOCAITES

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the density and height of existing vegetation, and the steep topography (Figure 4-6-A). Unobstructed views of the site are available only from higher elevations on the currently undeveloped opposite wall of Strawberry Canyon.

Partial views of the site are accessible from some portions of three traffic turnouts along Grizzly Peak Boulevard, above the site to the east. These turnouts are used by motorists and cyclists stopping for the panoramic views west toward the San Francisco Bay. From these viewpoints, the proposed site appears as a tree-covered knoll (Figure 4-5-D) approximately one-half mile or more away. A PG&E electric power transmission line crosses above the upper end of the site. The steel support towers of the transmission line are visible from the public turnouts. However, the site of the proposed facility cannot be seen while driving or bicycling along most other sections of Grizzly Peak Boulevard.

Light and Glare

The area immediately surrounding the proposed site is undeveloped and existing nighttime lighting is minimal. Lighting for existing buildings and storage areas in the Life Sciences Research Area is provided for security. The existing security control gate at the entrance to the Life Sciences Research Area is well lit to discourage unauthorized access.

IMPACTS

This section evaluates the proposed action in terms of its potential to produce a substantial, demonstrable negative aesthetic effect. The examination of aesthetics in this section involves analysis of the proposed action's compatibility with existing buildings and landforms; potential view blockage; changes to existing vegetation; effects from light and glare; and the visual consequences of removing several cargo contains from the existing HWHF site.

Building and Site Design

The development of the proposed site would consist of a two-story building, exterior yard areas and an access road. Preparation of the building, yard, and access road areas would involve grading moderately to steeply sloping terrain and would remove some on-site vegetation. Existing trees and vegetation would be preserved to a maximum extent compatible with facility design. Grading would result in permanent cut and fill slopes. Land form modification and grading impacts are described in Section 4.5, Geology, Soils and Seismicity. Site development would also result in the relocation of the existing fence line and the construction of a new eight-foot security fence at the northern end of the site.

The new building would be a reinforced concrete steel frame structure with external metal siding. The main axis of the building would be generally north-south. The building would be set back into the hillside with access to the first floor level gained on the east side and access to the second floor on the west. To accommodate the change in grade, the building would step down at the south end to maintain an appearance as a two-story structure. The profile of the proposed building would be characterized by overhanging eaves and sloping roof surfaces.

The action would cause a substantial change in the visual environment of the site in terms of the removal of vegetation, alteration of land form, and the construction of a new building, exterior yard areas, and an access road. However, the action, with the measures noted for visual impacts, would not produce a substantial negative aesthetic effect.

Impact

4.3-1 **The proposed building, yard areas, and access road would introduce new visual elements into the visual environment of the site vicinity.**

The following factors would limit the visual impact of the action:
A low-profile structure would be constructed that would be set back into the existing vegetation and landscape. The color of external building elements would be muted in tone to harmonize with surrounding elements.

Severe angular cuts and/or filling which results in an unnatural or engineered appearance would be avoided where feasible. Graded slopes would be feathered and rounded where feasible to provide a natural transition between the graded site and adjacent ungraded areas. Grading would be minimized through the use of retaining walls where compatible with proper design.

Views

The proposed building would be set into the perimeter of a eucalyptus grove to the west of the building site. The facility would not obstruct views from adjacent areas or buildings. The building profile would not impact the visual horizon when viewed from above. The action would alter views of the site currently seen from some turnouts along Grizzly Peak Boulevard. As viewed from the turnouts, the proposed building would be seen against a background of eucalyptus trees that would act to reduce visual intrusion.

Impact

4.3-2 **Views of the proposed site from some points in the immediate vicinity and from Grizzly Peak Boulevard turnouts would be altered.**

The following factors would limit the impact on views of the site:
Landscaped buffering would be provided between new construction areas and adjacent buildings and roads to screen views and to diminish potential visual intrusion. New landscaping would utilize native materials and be arranged informally. Plants would be "deer resistant" or protected from browsing animals until well established.

The exterior storage yard, generator and ancillary equipment area would be fenced and visually screened.

Views of the facility from the south and west along Centennial Drive would be blocked by existing landscaping adjacent to the road, by hillside slopes and by existing buildings on the site. Views of the site from portions of Centennial Drive to the north of the site would be prevented by existing topography and stands of eucalyptus trees. Views of the proposed site from areas adjacent to Panoramic Drive south of the site also would be obstructed by intervening vegetation and land forms.

Light and Glare

The action would involve additional lighting in the area but would not result in substantially increased light or glare impacts. Exterior lighting would be used to illuminate areas of the site and increase safety for LBL personnel and traffic circulation. Exterior security lighting would be visible from the turnouts on Grizzly Peak Boulevard. However, motorists on Centennial Drive would not be aware of exterior lighting from the facility.

Bright, reflective or light colors would be avoided on roof areas to lessen the impact of glare. Spill-over lighting would be minimized by utilizing exterior light standards that are focused and directional. Light poles would not be above 15 feet in height. Lighting baffles would be installed where appropriate.

Existing HWHF

Several large storage containers at the existing HWHF building (Building 75A) would be removed as part of the proposed action. Removal of structures that do not have architectural significance would allow the provision of a new permanent structure designed to complement the LBL site.

Impact

4.3-3 **The action would remove outdoor storage areas from the visual environment of the existing HWHF vicinity.**

The following factor would limit the impact on the visual environment of the existing HWHF vicinity:

Any residual building materials or other remnants of the existing HWHF activities would be removed from the Shop and Support Facilities Area after the transfer of operations to the replacement facility.

CUMULATIVE IMPACTS

The action would replace an open space area with an area of structures and other improvements (i.e., road, access and yard areas), and therefore would alter the visual character of the site vicinity. However, the action would allow future improvement of the visual quality of the existing HWHF site by development of future projects with more compatible aesthetic qualities.

4.4 VEGETATION AND WILDLIFE

SETTING

Vegetation

General Vegetation Cover

The vegetation cover of the proposed site vicinity is typical of the Berkeley Hills. The most common and widespread types are: 1) Baccharis brushland, 2) coastal sagebrush scrub, 3) oak-bay woodland, 4) annual grassland, and 5) eucalyptus plantations. In addition to these native or naturalized communities, landscape plantings around existing roads and buildings provide another component of vegetation cover on the vicinity (Figure 4-7).

1) Baccharis Brushland. This is the major vegetation cover type within the area. It forms an open to dense shrub layer, approximately two meters (m) tall in some areas. Coyote brush (*Baccharis pilularis* var. *consanquinea*) is the dominant plant species.

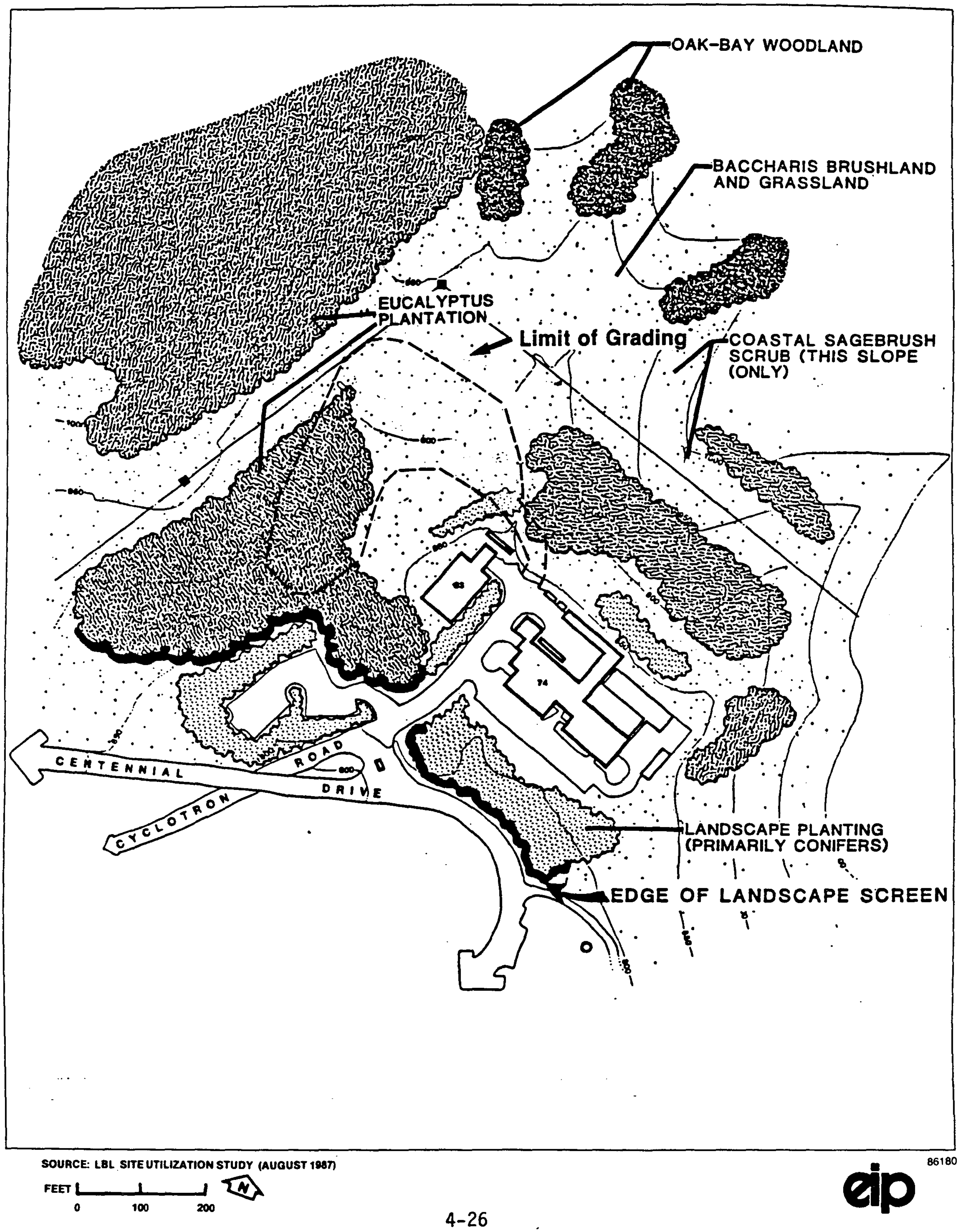
2) Coastal Sagebrush Scrub. This sparse to open, low (up to one m) shrub type covers a limited area within the vicinity on the exposed south and west-facing slopes of two spur ridges to the northeast of the site boundary. Coastal sagebrush scrub is characterized by local dominance of California sagebrush (*Artemisia californica*). This vegetation type has a characteristic native perennial grass component composed of Hall's bent-grass (*Agrostis hallii*) and purple needlegrass (*Stipa pulchra*).

3) Oak-Bay Woodland. A dense woodland dominated by two tree species, coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*) occurs in ravines. In general, the oak-bay woodland vegetation type covers approximately 25 percent of the land area defined as the Berkeley Hills. Stands of Oak-Bay Woodland occur north of the PG&E right-of-way and outside the boundary of the site.

4) Annual Grassland. Patches of grass-dominated vegetation generally occur within the area of the proposed action on disturbed sites. The major grass species are introduced annuals such as soft chess (*Bromus mollis*), wild oats (*Avena* spp.), and wild barley (*Hordeum* spp.). Low-growing, broad-leaved plants commonly associated with annual grassland

EXISTING VEGETATION

FIGURE 4-7



SOURCE: LBL SITE UTILIZATION STUDY (AUGUST 1987)

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include rabbit-foot clover (*Trifolium arvense*), cut-leaved geranium (*Geranium dissectum*), and English plantain (*Plantago lanceolata*).

5) Eucalyptus Plantations. Extensive stands of introduced eucalyptus trees occur in the area. Blue gum (*Eucalyptus globulus*) occurs on west-facing slopes and mixed stands of blue and red gum (*Eucalyptus tereticornis*) dominate the ravines. The trees reach a height of approximately 80 to 100 feet and are 10 to 40 inches in diameter.

6) Landscape Plantings. Extensive landscape plantings surround existing facilities. These plantings include Monterey pine (*Pinus radiata*), knobcone pine (*Pinus attenuata*), and redwood (*Sequoia sempervirens*). There are no naturally occurring, native stands of these trees on the site.

Species of Concern

The following defines the term "species of concern" used in this section. A plant or animal species of concern is a species or subspecies that falls into one of the following categories:

1) It is listed as endangered or threatened in accordance with the Federal Endangered Species Act (FESA).

2) It is listed as endangered, threatened, or rare in accordance with the California Endangered Species Act (CESA).

3) It is a candidate for federal listing (C2) or state listing (C). While not protected by either FESA or CESA, it is the policy of some state and federal agencies to manage these species in order to prevent them from becoming listed.

4) It is considered by the California Department of Fish and Game (CDFG) to be a Species of Special Concern. The CDFG often requests that these animal species be considered in the impact section of environmental documents.

5) It is a plant species that occurs in the California Native Plant Society (CNPS) Inventory. Some state and federal agencies request that CNPS List 1 and List 2 plants be considered in

the impact section. Less frequently, an agency may request the inclusion of plants on the CNPS List 3 and List 4.

Plant Species of Concern

There are at least three plant species of concern known to occur within the general vicinity of the Berkeley Hills area. The known distribution of these species near the LBL site area is described below:

- Presidio clarkia (*Clarkia franciscana*): This species has been seen in the vicinity of Skyline Boulevard in Oakland. It is associated with serpentine outcrops, often growing with Brodiaea ssp., Hemizonia ssp. and Calochortus ssp.
- Alameda manzanita (*Arctostaphylos pallida*): This species is associated with Monterey pines, redwoods, madrone and coyote brush. The Alameda manzanita has been found in the Oakland Hills on Skyline Boulevard, in the Huckleberry Botanical Preserve, and in areas near Joaquin Miller Park, Roberts Recreation Area, and Redwood Regional Park.
- Diablo rock rose (*Helianthella castanea*): The species is associated with grassy hillsides in grassland and oak woodland plant communities. It was last seen in the Oakland Hills in the 1920s at Leona Heights.

The Presidio clarkia is generally associated with serpentine outcrops and soils. Serpentine does not occur on the proposed site. The remaining species, Alameda manzanita and Diablo rock rose, may occur in parts of the Strawberry Creek drainage basin beyond the Life Sciences Research Area. However, no manzanitas, including the Alameda manzanita, and no rock roses were found on the facility site during a field survey conducted on March 20, 1988 by EIP Associates.

Wildlife

General Wildlife

The area surrounding the proposed site supports a variety of native wildlife. Tracks and other signs of deer, rabbits, squirrels, and gophers were observed during a wildlife survey of the site performed by EIP Associates. Fox, skunks, raccoons and other mammals are also known to frequent the Berkeley Hills area. Birds in the area include mourning dove, California quail, brown towhee, scrub and Steller's jay, common bushtit, Anna's hummingbird, and wrentit. Red-tailed hawk and turkey vulture are frequently seen over the entire hill area. Most likely reptiles and amphibians in the vicinity include California slender salamander, ensatina, California newt, common garter snake, western fence lizard, and northern alligator lizard. The following sections discuss the habitats found at LBL, and endangered and threatened species in the area:

Wildlife Habitat

- Oak-Bay Woodland Wildlife Habitat. Among the most conspicuous and common wildlife using this habitat are black-tailed deer, western gray squirrel, deer mouse, bobcat, black-tailed jackrabbit, steller's jay, acorn woodpecker, and bandtailed pigeon. Food, shade and nesting sites are provided by the oak woodland habitat. Other common birds include the California quail, mourning dove, and various species of hawks and owls.
- Baccharis Brushland Wildlife Habitat. Wildlife species using these areas include brush rabbit, gray fox, striped skunk, scrub jay, common bushtit, and coast garter snake.
- Annual Grassland Wildlife Habitat. These grassland areas provide suitable habitat for a number of small mammals and their predators, upland game, songbirds and reptiles.
- Eucalyptus/Bay Wildlife Habitat. The ravines and drainage areas lined with these trees provide food, water, cover, nesting, and migration and movement routes for wildlife. Mammals such as raccoon and striped skunk are common residents. Black-tailed deer, gray fox, yellow warbler, tree swallow, great-horned owl, and red-tailed hawk are occasional visitors. Reptiles and amphibians such as the aquatic garter snake, Pacific tree frog, and bullfrog are common in and around quiet streams.

Endangered and Threatened Wildlife

The Federal Endangered Species Act of 1973 (as amended) provides a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved and provides a program for the conservation of such endangered species and threatened species. The Secretary of the Interior determines whether any species is an endangered species or a threatened species on the basis of the best scientific and commercial data available. The Secretary of the Interior designates critical habitat for such species. It is the policy of Congress that Federal agencies shall seek to conserve endangered species and threatened species.

There are three threatened or potentially threatened wildlife species known to occur within the general vicinity of the Berkeley Hills. The known distribution of these species relative to the proposed site is described below:

- Bay checkerspot (*Euphydryas editha bayensis*): This rare butterfly is found in areas of serpentine rock and soils in grassland habitats. Its primary food sources are plant species associated with serpentine soils (*Orthocarpus densiflorus, Plantago erecta, Lasthenia* *chrysostoma, Layia platygloss, Lovanthus* spp., and *Lomatium* spp.). The Bay checkerspot has been found in San Joaquin Miller Park and in the hills of San Leandro. It is listed as a threatened species under FESA.

- Alameda striped racer (*Masticophus lateralis euryxanthus*): This rare snake occurs from the San Francisco Bay area to the vicinity of Monterey. The species is associated with valley-foothill riparian habitats and is known from Leona Park and the Grizzly Peak area of Oakland and the Berkeley Hills. It is cited a Category 2 species by the U.S. Fish and Wildlife Service (FWS).[1]

- Callippe silverspot (*Speyeria callippe callippe*): This butterfly has been found in the Oakland Hills, and at Joaquin Miller and Redwood Regional Parks. Observation records of this species in the area may be erroneous, however, because of the similarity of this species to another butterfly, *Speyeria callippe comstocki*. The Callippe silverspot is considered to be scarce or extinct within its historical range in the East San Francisco Bay. It is cited as a Category 2 species by the FWS.[1]

The Bay checkerspot is generally associated with serpentine outcrops and soils. Serpentine does not occur on the facility site. The Alameda striped racer may occur in the vicinity of the Life Sciences Research Area site, in the ravines and tributaries to Strawberry Creek. However, it was not observed during a March 20, 1988 field survey. The Callippe silverspot were not observed in the field survey and are assumed not to occur at the site. According to the FWS, no proposed species (for listing as Endangered or Threatened species), including the Alameda striped racer and the Callipe silverspot, occur within the project area.[2]

A Biological Assessment was performed for the proposed action in May 1991 (Appendix E). The assessment included a field survey for animal species of concern (see definition above) and for habitat of such species. No evidence was found to indicate the existence of any of the vertebrate or invertebrate species of concern at the site of the proposed action.[3] Appendix E of this document also contains a letter from the FWS acknowledging the conclusions of the assessment.

A site inspection by an officer of the CDFG was performed as part of the environmental review process to determine potential CDFG jurisdiction at the site. Because the action involves filling a drainage channel, the CDFG was consulted to discuss the possible need for a Streambed Alteration Agreement. The CDFG may require such an agreement for projects under California Fish and Game Code Section 1603 for the placement of fill within a drainageway. The CDFG has not claimed jurisdiction of the site of the proposed action because of the absence of critical habitat and valuable wildlife resources. A Streambed Alteration Agreement for the action is not required.[4]

IMPACTS

This evaluation reviews effects on the following resources:

- Locations and/or principal concentrations of endangered and/or threatened species, commercial species, or game species, and presence of suitable habitat.[5]
- Areas of permanent or seasonal concentrations of wildlife species.
- Areas of mature landscaping comprised of specimen tress and/or unique vegetation.
- Riparian habitat.
- Wetlands habitat.
- Native California plant communities.
- Spawning and nursery stream habitat.
- Areas of scientific or educational use.

Vegetation

LBL conducted a survey of the site and identified tree species and vegetation that would be removed as a result of the action.[6] A site survey was performed by EIP Associates which indicated that there would be no impacts to plant species of concern. Further, the Biological Assessment performed for the proposed action concluded that the action would not represent a threat to any vertebrate or invetebrate species of concern, indicating that no habitat for such species would be affected.[7] Based on consultation with the FWS, and on field surveys and a biological assessment of the site of the proposed action, the action would not affect any plant species of concern or result in the destruction or modification of critical habitat.

The proposed action would result in the removal of baccharis brushland and some oak, bay, and eucalyptus trees as follows: approximately 20 bay trees with trunk diameters of 4 inches to 12 inches, approximately 17 oaks with 4-inch to 10-inch diameter trunks, and 98 eucalyptus trees having trunks of 10 inches to 36 inches. The removal of existing vegetation would not substantially reduce the density or variation of trees in the Strawberry Canyon watershed. The removal of vegetation would have a substantial effect on the natural resources of the project site.

However, subsequent revegetation and landscaping would be performed. The removal of eucalyptus trees is supported by the UC Hill Area Fire Management Plan.

<u>Impact</u>

4.4-1 The action would result in the removal of existing vegetation at the proposed site, including approximately 37 native trees.

The following factors would limit the impact on vegetation resources at the site:
Disturbed areas not covered by improvements (e.g.,structures, hard surface) would be hydroseeded after the completion of grading. The site would be revegetated according to the landscape plan prepared by the retained A/E firm. Areas disturbed during construction would be revegetated with fire-resistant and native plant species to the maximum extent feasible.

Cut, fill, and land grading would be conducted in a manner to minimize tree removal and injury to mature trees. The roadway alignment would be used in the design of fire breaks for the site to minimize the removal of vegetation.

Landscaping would be introduced as illustrated in Figure 2-8. Hydroseeding would be performed as soon as feasible after the completion of grading to establish vegetative cover. The hydroseeding mix that would be used has been identified by the landscape architect as: Blando Brome, Lana Vetch, Ariki Rye, Rose Clover, Central Valley Wildflower Mix and Briza Maxima. Plantings on crib wall faces and benches would include manzanita (`Bearberry,' `Monterey Carpet,' `Point Reyes,' and `Radient') junipers, `creeping' rosemary, and toyon. Landscaping shrubbery and trees would be planted in other areas disturbed by construction and would include the following: shrubbery _ coyote bush and oleander; trees _ Monterey Pine, Live Oak, Bay, Grecian Laurel, and `Los Altos' Redwood. Approximately 60 trees of the types listed above would be planted.

Wildlife

Impacts and mitigation measures regarding the removal of vegetation also would apply to maintaining wildlife habitat and wildlife species. Based on consultation with the FWS, and on field surveys and a biological assessment of the site of the proposed action, the action would not directly affect any animal species of concern or result in the destruction or modification of critical habitat.

The direct loss of brush and eucalyptus habitat is not considered to represent a significant impact, as these habitats are widely distributed in the Berkeley Hills. No critical breeding or foraging sites, migration corridors, or other critical wildlife resources occur on the proposed site. Due to construction noise and human intrusion a temporary decrease in wildlife use of adjacent undeveloped areas is expected.

The nearby Ecological Study Area would experience some increased noise levels during the construction period. However, no substantial changes in wildlife species composition are expected to occur. No related loss of teaching or research opportunities is expected. The action would involve placing a section of the ephemeral stream which crosses the western portion of the site underground. Alteration of the streambed downstream from the site has already occurred, however, and the amount of habitat lost due to stream undergrounding would not be a substantial part of potential striped racer habitat in the area.

CUMULATIVE IMPACTS

The action would contribute to the cumulative removal of vegetation and potential wildlife habitat in the Life Sciences Area of LBL. This effect may also be viewed in the larger contexts of LBL, the University "Hill Area," the University as a whole, and the Berkeley Hills area. Although the action would substantially alter the vegetative setting at the proposed site, its effect on cumulative loss of vegetation and potential wildlife habitat in the larger context of the Berkeley Hills would not be substantial.

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1 Category 2: Taxa for which existing information indicated may warrant an Endangered Species Act listing, but for which substantial biological information to support a proposed rule is lacking.

2 U.S.Fish and Wildlife Service, letter to Gordon Becker, EIP Associates, January 7, 1991.

3 John Garcia, Principal, BioSystems Analysis, Inc., letter to Dr. Ira Fink regarding the results of Biosystems Analysis, Inc.'s Biological Assessment for the proposed action, May 23, 1991.

4 Terry Palmisano, Wildlife Biologist, California Department of Fish and Game, personal communication with EIP Associates, September 7, 1989.

5 California Department of Fish and Game, California Natural Diversity Data Base, 1988.

6 Site Plan, East Canyon Corporation Yard, Design Development, Kennedy/Jenks/Chilton, May-31, 1989.

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[7] John Garcia, op. cit.

4.5 GEOLOGY, SOILS AND SEISMICITY

SETTING

The eastern portion of LBL is located on the northwest wall of Strawberry Canyon in the Berkeley Hills approximately between elevations +700 feet and +1100 feet above mean sea level (msl). It occupies a portion of the Strawberry Canyon drainage system and is characterized by moderate to steeply sloping terrain. Differential erosion of soil and rock materials of varying engineering characteristics has resulted in the diverse topography evident in the region.[1]

The Berkeley Hills are underlain by a complex sequence of bedrock ranging in age from Jurassic to Tertiary. Bedrock in the area is highly deformed from past tectonic activity and is generally overlain by surficial deposits of Quaternary valley colluvium (the material accumulated by the natural erosion and sedimentation processes that wear down hillsides). The colluvial soils that have formed contain silt and clay with variable amounts of rock fragments. Much of this material has accumulated as reworked slope wash debris including landslide deposits.[2]

<u>Site Topography and Geology</u>

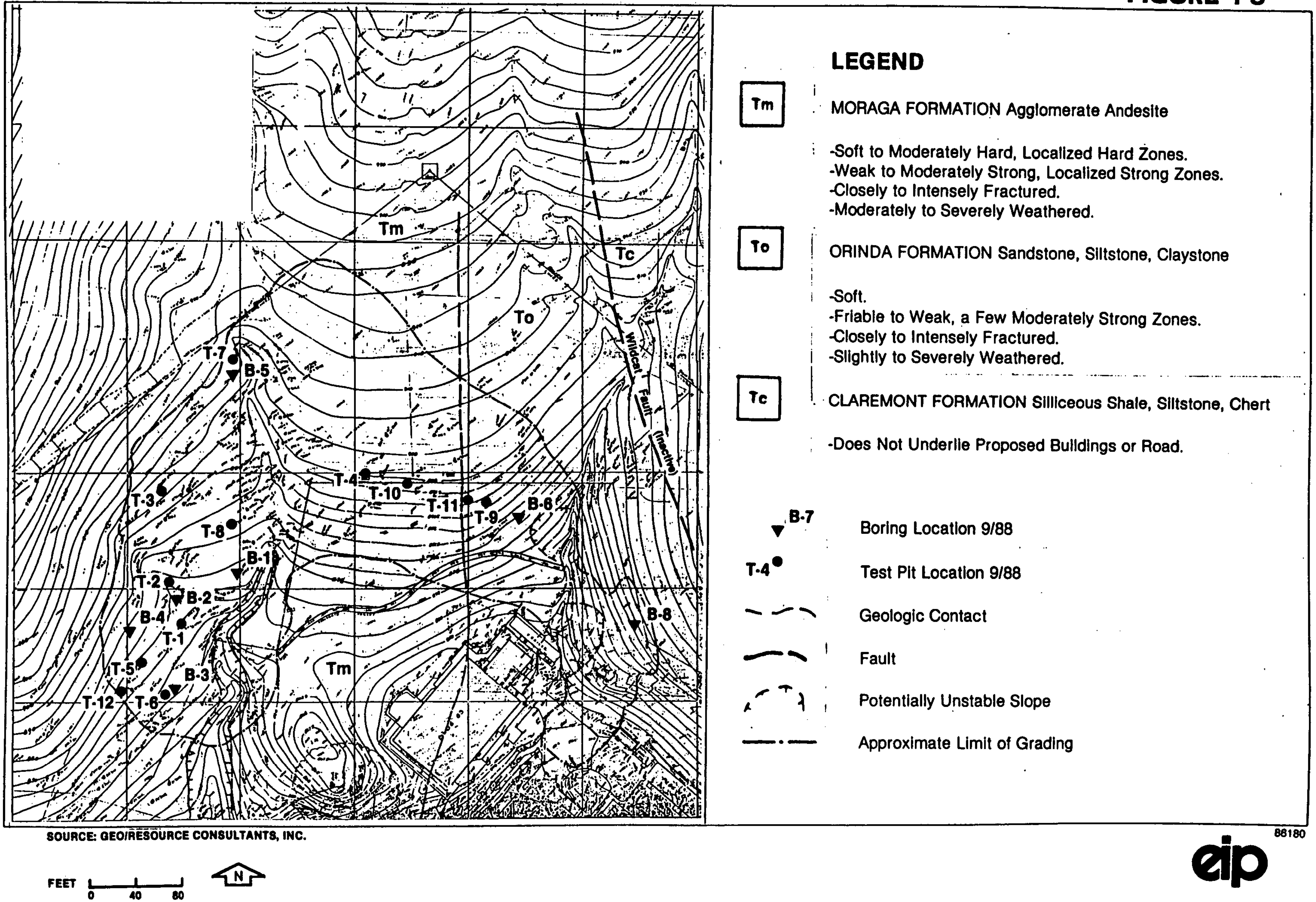
The proposed site occupies approximately three acres between the +830 and +930 msl contours in the LBL Life Sciences Area (Figure 4-8). Site topography is dominated by the general southerly slope of the vicinity and by a north-south trending drainage channel that crosses the site's eastern portion as shown in Figure 4-8.

Existing slopes within the site boundaries are complex and vary from nearly level to greater than 25 percent. On the north-south axis between the projected upper and lower limits of grading, the existing generalized slope is approximately 23 percent. The area between the proposed western grading limit and the eastern edge of the HWHF yard area currently slopes at about 16 percent downward to the east. This degree of generalized slope continues from the proposed yard area to the eastern extent of the site.

The site is mapped as colluvial soils over the volcanic bedrock of the Moraga Formation, which, in turn, overlie the weak sedimentary rocks of the Orinda Formation (Figure 4-8).[3] The volcanic rock (Moraga Formation) consists of andesite and basalt flows interbedded with pyroclastic deposits, all of which are deeply weathered. The Moraga Formation is not well solidified,

SITE GEOLOGY MAP

FIGURE 4-8



SOURCE: GEO/RESOURCE CONSULTANTS, INC.

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resulting in an inherently weak material.[4] Rocks of the Orinda Formation in this area are sandstone, siltstone and claystone that tend to be weak and poorly consolidated.[5]

The contact between the Moraga and Orinda Formations is highly irregular.[6] The main contact between the two formations crosses the proposed road alignment east of the proposed building location. As mapped in Figure 4-8, the building and surrounding yards would be underlain primarily by rocks of the Moraga Formation. The eastern section of the road would be underlain mainly by the Orinda Formation. Depth to bedrock ranges from one foot to about 18 feet.

The Orinda Formation is well-known for forming unstable slopes in the area.[7] There are some potentially active landslide deposits in the vicinity of the proposed road alignment as shown in Figure 4-8. This indicates that slope stability is an important consideration in the design of roadcuts. In addition, there is a small repaired landslide behind the trailer at the northeast side of Building 83. The repaired landslide appears to be in an area underlain by the Orinda Formation.

Slopes underlain by the Moraga Formation in the western part of the site, including the area of the proposed main building, do not show evidence of recent or potentially active landsliding.[8] However, there is some ravelling and shallow debris sliding in the eroded banks of the western swale, as indicated in Figure 4-8.

The colluvial and residual soils on-site primarily are clay and gravelly clay. In the area of the proposed building, soils extend to a depth of about 15 feet. Along the road alignment, soils range from one foot thick near the western end to more than 15 feet near the existing drainage channel. Borings made in the area to depths of 16 to 27 feet did not encounter groundwater. The locations of the borings and test pits at the project site are shown on Figure 4-8.

Slope stability is good in the unweathered basalt, but generally only fair to poor in the other formations, especially where clayey material has created planes in which slippage can occur, and in zones of sheared rock that have been weakened by seismic activity. The foundation conditions are good only in the unweathered basalt; they are relatively poor to fair in the other formations, especially where expansive clays occur, and in the sheared zones mentioned above.[8,9]

Seismicity

The Bay Area is part of the most active seismic region in the United States. Every year, low and moderate earthquakes occur within or near the region. There are several active and potentially active fault zones that could affect urban development in the Bay Area. These include faults that are historically active (during the last 200 years), those that have been active in the geologically recent past (about the last 10,000 years, usually referred to as Holocene faults), and those that have been active at some time during the Quaternary geologic period (the last two million years). The Hayward fault, the Calaveras fault and the San Andreas fault (major features of the San Andreas rift system) are historically active. Faults that occur east of the Berkeley Hills have been classified as Quaternary or older because they do not display evidence of recent movement.

Several of the major fault zones in the San Francisco Bay Area are capable of causing strong ground motion at the proposed site.[10] The Calaveras fault is about ten miles east of the site, the Hayward fault is approximately 2/3 mile to the west, and the San Andreas fault is 18 miles east of the site. The Hayward and Calaveras faults are each capable of generating a maximum credible earthquake (MCE) of Richter magnitude (Rm) 7.5; the northern section of the San Andreas fault could generate an MCE of Rm 8.3.[11,12]

The Wildcat fault, one of the longest of the many faults in the Berkeley Hills, passes a short distance east of the site (Figure 4-8). The fault has been mapped in detail by Harding-Lawson Associates in their report dated February 19, 1980. The fault is located approximately 400 feet away from the proposed structure and about 80 feet away from the proposed roadway alignment. Investigation of this fault in the vicinity of Building 74, east of the site, revealed no evidence of recent displacement.[13] An exploratory trench excavated by Harding-Lawson Associates north of the proposed site indicated that the fault was nearly vertical.[14]

The California Division of Mines and Geology advises that all proposed construction in the vicinity should be preceded by fault trace studies to establish the presence or absence of a fault and the level of activity of any faults located on the construction site.[15] The Wildcat fault has been mapped in the vicinity of the proposed site and its potential activity examined. Because the Wildcat fault is not considered active and because the fault trace does not cross the site, it does not represent a rupture hazard requiring special constraints to the action.[16]

Seismic Hazards

The State of California has delineated Special Study Zones around active and potentially active faults in the state. The zones extend about 700 feet on either side of identified fault traces. No structures for human occupancy may be built across an identified active fault trace.[17] Pursuant to the Alquist-Priolo Act of 1972, the Hayward fault has been designated a special studies zone. However, the proposed site is located about 2/3 mile outside the eastern edge of the zone for the Hayward fault and its associated traces.

LBL has carried out a comprehensive earthquake safety program since 1973. All new facilities are designed and constructed to resist the maximum credible earthquake forces estimated for the sites. Buildings on the LBL site are required to meet the design requirements of DOE Order 6430.1A to reduce seismic hazards in new buildings. In addition, LBL has established lateral force design criteria which are more stringent than DOE 6430.1A. For example, LBL criteria establish the base shear for this facility as 0.28 W compared to 0.23 W required by DOE 6430.1A, where W is the total dead load of the structure. In addition, a dynamic analysis of the facility using the postulated ground motion from a magnitude 7.0 earthquake on the Hayward fault will be performed and the structure will be designed to accommodate the forces and displacements resulting from this dynamic analysis.

Earthquake-induced landsliding of steep slopes can occur in either bedrock or unconsolidated deposits. Soil conditions related to instabilities can be created by steep slopes, shallow soil development, the presence of an excessive amount of water, or the lack of shear strength in the soil or at the soil/rock interface. Firm bedrock usually can stand in steeper slopes than soils are able to maintain. Rock type, grain size, degree of consolidation and angle of beds all contribute to the strength or weakness of a bedrock hillside. Shales and deeply weathered rocks are very susceptible to slope failures. Seismic activity induces some landsliding, but most slides result from the weight of rain- saturated soil and rock exceeding the shear strength of the underlying material. Erosion of supporting material at the toe of the landslide or of the landslide-exposed slopes further contributes to instability.

Another response to severe groundshaking that can occur in loose soils is liquefaction. This transformation from a solid state to a liquid state ("quicksand"), as a response to seismically-induced liquefaction does not affect bedrock, however it does affect certain types of alluvium under conditions of saturation.[18] The transformation can be very rapid. The soil characteristics of a liquefaction-prone deposit are: saturated conditions; loose, uniformly fine sand; little or no clay-sized particles to act as binders; and sufficiently violent vibration to increase pore pressure beyond the shear strength of the sand particles. If these conditions occur within about 30 feet of the ground surface, any structures supported on the soils would be subject to tilting or settlement (sometimes very violent and rapid) as the supporting capabilities of the soil diminish. Liquefiable material at or near the ground surface would need to be replaced or compacted before it could be used as structural support.

Other Geotechnical Conditions

There are six soil conditions in the Berkeley Hills area that could contribute to the potential instability of a structure and have been considered during the planning phase of this action: 1)-liquefaction; b) impermeability; c) expansiveness; d) settlement; e) erosion; and f) landsliding. Site-specific geotechnical investigation has been performed as required to refine the regional interpretation and determine specific remedial actions regarding these conditions.

a) Liquefaction can occur in loose soils due to groundshaking. As described earlier, liquefaction is the transformation of a solid state to a liquid state, resulting in ground settling, landsliding and lurch cracking. Earthquake-induced liquefaction does not affect bedrock, however it does affect certain types of alluvium under conditions of saturation. Liquefiable material at or near the ground surface usually needs to be replaced or recompacted before it can be used as structural support.

b) Impermeability, or a very slow rate of percolation, can produce structural problems if water collects beneath or within the foundations of buildings. Positive drainage must be established to prevent supporting soils from becoming weakened by saturation.

c) Expansiveness, or the potential to swell and shrink with repeated cycles of wetting and drying, is another fairly common feature to fine grained soils. If left in place these weak soils can cause unacceptable amounts of settlement. The effects can range from the nuisance level (sticking doors and windows) to major structural damage level (shifted or collapsed foundations). Combined with seismic loads, the effect could be sufficient to make the difference between survival and destruction of the foundation system during a major earthquake.

d) Settlement is a function of the compressibility of loose deposits, such as uncompacted fill, and the weight of overlying fill or structures. Settlement occurs within the fill as the material readjusts to the load being added. Fill composed primarily of sand is not susceptible to post-construction settlement unless the sand fill has an extremely low density.

e) Erosion potential is variable throughout the Berkeley Hills area. Soil erosion can be a problem for foundation components in ways similar to those produced by expansive soils. Basically, the loss of foundation support can result from excessive erosion.

f) Landsliding is a significant component of the natural erosional processes. Static slope instability is the major cause of landslides other than those induced by seismic vibration. Landslides, earthslips, mudflows and soilcreeps are all expressions of soil conditions related to the instabilities created by steep slopes, shallow soil development, the presence of an excessive amount of water, or the lack of shear strength in the soil or at the soil/rock interface. Each of these conditions is observable in the Berkeley Hills. Erosion of supporting material at the toe of the landslide or of the landslide-exposed slopes further contributes to instability.

Another unstable situation exists where the bedding planes or rock strata are parallel to the surface slope of the ground. In this case the potential exists for entire rock units to slip along a weakened plane.

The steepness of a slope is a major component of instability because of the unsupported weight of rock and soil that may bear on a weak zone. Such human activities as making road cuts, diverting surface runoff or impounding water can reduce the natural shear strength of bedrock slopes, and generate landsliding even in areas of normally low susceptibility.[19]

IMPACTS

The potential geologic, soils and seismic effects of the proposed project are considered from two points of view: construction impacts and hazards to people or structures. The basic criterion applied to the analysis of construction impacts is whether or not implementation of the action would cause substantial erosion or create unstable geologic conditions that would last beyond the short-term construction period. The analysis of hazards involves determining the degree to which the action would produce hazard to people or structures from seismically-induced groundshaking, secondary ground failure, rock or soil instability, or other soil conditions.

Construction Impacts

Impact

4.5-1 **Site excavation and grading could create unstable earth conditions on-site that could pose a hazard to construction personnel and equipment.**

Grading would be necessary to prepare the building site, yard areas, and access road for the proposed facility. A portion of the drainage channel which crosses the site would be filled. The maximum thickness of fill would be on the order of 20 feet and the deepest cut along the roadway alignment would be approximately 20 feet. A cut in the planned borrow area north of the building would be about 30 feet. It is the design intent that site development would optimize cut and fill operations to the extent feasible and minimize impacts on existing undeveloped hillsides. Retaining walls would be utilized to retain slopes in most cut areas rather than removing additional earth materials. An estimated 21,000 cubic yards of excess material would be generated that would be transported off-site.

The following factors would limit the impact from grading and excavation:

Temporary and permanent altered slopes on-site would not exceed the maximum height and gradients recommended by the geotechnical engineer. Where needed, design would utilize structural retaining walls and crib retaining walls to retain soil slopes.

Excavations would be shored as required by OSHA regulations to preclude trench and embankment failures during the construction period.

Impact

4.5-2 **Facility site areas disturbed by construction activities could be subject to short-term and long-term erosion.**

The following factors would limit the erosion impact:
Construction would be performed according to the Association of Bay Area Governments (ABAG) standards regarding erosion control.

Construction would incorporate recommendations from the geotechnical report regarding erosion control.

Disturbed areas would be replanted as soon as feasible after the completion of grading. Plantings would be used on surfaces of cut and fill areas to collect surface runoff and reduce erosion. A landscape maintenance program would be conducted.

Lined drainage ditches would be constructed on all cut slopes to intercept surface runoff.

Geologic Hazards

The proposed building and access road would be located on cut and fill slopes. The existing site also has variable slope stability conditions, which have been analyzed in the project geotechnical report. The adverse effects of these conditions would be lessened by incorporation of the geotechnical report recommendations cited above. Geologic hazard considerations relate to ensuring a stable site during static as well as dynamic conditions.

Impact

4.5-3 **Facility elements could be subject to damage resulting from improper surface or subsurface drainage or from improper compaction or composition of fill.**

The following factors would limit the impact on facility elements:
Design specifications for foundations of the proposed structures and engineered fill would conform to recommendations made by the California registered geotechnical engineer retained by LBL.

Benched keyways, subdrains and culverts would be utilized as necessary to eliminate the effects of the subsurface conditions, along with building foundations designed to resist the designated vertical and lateral loads.

Impact

4.5-4 **Earthquake groundshaking at the site could cause structural damage and subsequent hazard to building occupants. Non-structural elements, such as shelving, cabinets, bookcases and light fixtures, could become hazards to facility occupants.**

Should an earthquake of maximum credible magnitude occur along the Hayward, Calaveras or San Andreas faults, the facility site could experience violent groundshaking. During such an event, the intensity of groundshaking for the vicinity of the proposed site is estimated to be VIII on the Modified Mercalli Intensity Scale.[20] Fault rupture would not affect the site, because during the earthquake actual displacement would occur only along fault traces that are actively involved in the seismic event, none of which pass through the site. The main hazards to the proposed facility would be the strong ground motion resulting from the earthquake and some of the various types of ground failure associated with that motion.[21] During earthquake-induced groundshaking, the upper story of the structure would experience the greatest amount of sway.

The following would limit the impact from potential groundshaking:
Site work for foundations and other structural elements and new construction would comply with the Uniform Building Code, Title 24 of the California Code of Regulations, DOE building design criteria (Order 6430.1A), LBL standards, and the recommendations of the geotechnical report, whichever are most stringent.

Shelving, cabinets, bookcases and light fixtures would be securely bolted to walls and other structural elements according to LBL policy.

Other Geotechnical Considerations

Consolidated volcanic and sedimentary rock formations, such as those that occur at the site, are not subject to liquefaction; however, colluvial soils may be. Examination of the soil boring logs taken from the site does not reveal any obviously liquefiable zones in the colluvium. Fills at the site would be engineered to resist the intense groundshaking associated with seismic activity, and the potential for settlement effects would therefore be low. Similarly, proper design of the fill according to the recommendations of the geotechnical report would lessen the potential hazard from soil expansiveness.

The potential for seismically-induced landsliding in the general vicinity of the proposed site is moderate to high because of the relatively low slope stability of the colluvium and the sedimentary interbeds.[22] The site contains a certain amount of basaltic rocks, which have the characteristics of good slope stability, and to that extent the site is less landslide-prone. The geotechnical study concluded that potential landsliding impacts could be minimized through project design. As discussed above, the recommendations of the geotechnical report regarding slope stability, and fill and structure engineering, would form part of the action. Potential hazard from seismically-induced landsliding would not be significant.

Temporary or incomplete excavations and grades would be susceptible to failure should a major earthquake occur during the construction period. However, this is a hazard that is short-term and is considered acceptable for construction projects in the Bay Area.

CUMULATIVE IMPACTS

With the incorporation of the measures noted above, the action would not create new cumulative impacts associated with geology or geologic hazards. No long-term increase to erosion rates or geologically unstable conditions would result from implementation of the action.

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1 Geo/Resource Consultants, Inc., Geotechnical Investigation, Replacement Hazardous Waste Handling Facility, LBL, Berkeley, California, October, 1989.

2 D.H.Radbruch, Aerial and Engineering Geology of the Oakland East Quadrangle, California, U.S.Geological Survey, Geologic Quadrangle Map GQ-769, 1969, scale 1:24,000, accompanied by 15 pages of text.

3 T.W.Dibblee, Jr., Preliminary Geologic Map of the Briones Valley Quadrangle, Alameda and Contra Costa Counties, California, U.S.Geological Survey, Open File Report 80-539, 1980, scale 1:24,000.

4 S.R.Korbay, CEG 916, and H.Hanson, CE 9948, Preliminary Geotechnical Evaluation, Proposed East Canyon Corporation Yard Development, Lawrence Berkeley Laboratory, Berkeley, California, Harding-Lawson Associates, Job Number 2000,170.01, 18 January 1985.

5 Geo/Resource Consultants, Inc., 1989, op.cit.

6 Ibid.

7 Ibid.

8 D. H. Radbruch, 1969, op. cit.

9 Korbay and Hanson, 1985, op.cit.

10 California Division of Mines and Geology, Fault Map of California, Geologic Data Map 1, 1975, Scale 1:750,000.

11 Richter Scale: a logarithmic scale developed in 1936-37 by Dr.Charles F. Richter and Dr.Beno Gutenberg to measure earthquake magnitude by the energy released, as opposed to earthquake intensity as determined by local effects on people, structures, and earth materials.

12 R.D.Borcherdt, et al., Maximum earthquake intensity predicted on a regional scale, U.S. Geological Survey, Miscellaneous Field Investigations Map MF-709, 1975, scale 1:125,000.

13 Geo/Resource Consultants, Inc., op.cit.

14 Stephen R.Korbay, Certified Engineering Geologist, Harding-Lawson Associates, Wildcat Fault Study, Lawrence Berkeley Laboratory, Berkeley, California, HLA Job No.2000, 145.01, 19 February, 1980 and Harding-Lawson Associates, Geologic Investigation of the Building 74 site, HLA Job No.2000, 092.01, 25 July 1974.

15 Hart, E., Director of Alquist-Priolo Projects, California Division of Mines and Geology, communications with EIP Associates 19 September 1988 and 15 September 1989.

16 Geo/Resource Consultants, Inc., op. cit.

17 An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed construction within the Special Studies Zone can take place only following the completion of a geological report prepared by a California Registered Geologist.

18 Greensfelder, R.W., "Seismicity, Groundshaking and Liquefaction Potential," in: M.E. Huffman and C.F.Armstrong, Geology for Planning in Sonoma County, California Division of Mines and Geology, Special Report 120, 1980, pp. 5-14.

19 Huffman, M.E.and C.F.Armstrong, Geology for Planning in Sonoma County, California, Division of Mines and Geology, Special Report 120, 1980, 31 pages, 5 plates, map scale 1:62,500.

20 R.W.Greensfelder, Maximum Credible Rock Acceleration from Earthquakes in California, California Division of Mines and Geology, Map Sheet 23, 1974, scale 1:2,500,000.

21 Steinbrugg, K.V., et al., Earthquake Planning Scenario for a Magnitude 7.5 Earthquake on the Hayward Fault in the San Francisco Bay Area, California, Division of Mines and Geology, Special Publication 78, 1987. The reader is referred to this document for contemporary historical references to seismic activity on the Hayward fault. The reader is cautioned that many of the reports are anecdotal in nature, having been made prior to the availability of modern seismic recording techniques.

22 Korbay and Hanson, 1985, op.cit.

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4.6 HYDROLOGY AND WATER QUALITY

SETTING

The site of the proposed replacement HWHF is located within the 874-acre Strawberry Creek watershed which lies generally above Gayley Road and Highland Avenue. Strawberry Creek has two main branches, the South Fork and the North Fork. The South Fork watershed contains about 759 acres, including the proposed site, generally comprised of steep-sloping canyons covered with timber and/or brush and grasslands, and existing development. The site is in the 502-acre portion of the South Fork watershed called the Upper Strawberry sub-watershed (Figure 4-9). A 1980 Storm Drainage Study reported that about ten acres of the Upper Strawberry sub-watershed had been developed, including about four acres by LBL and about six acres by the combined development of UC Berkeley, private residences and roads.[1]

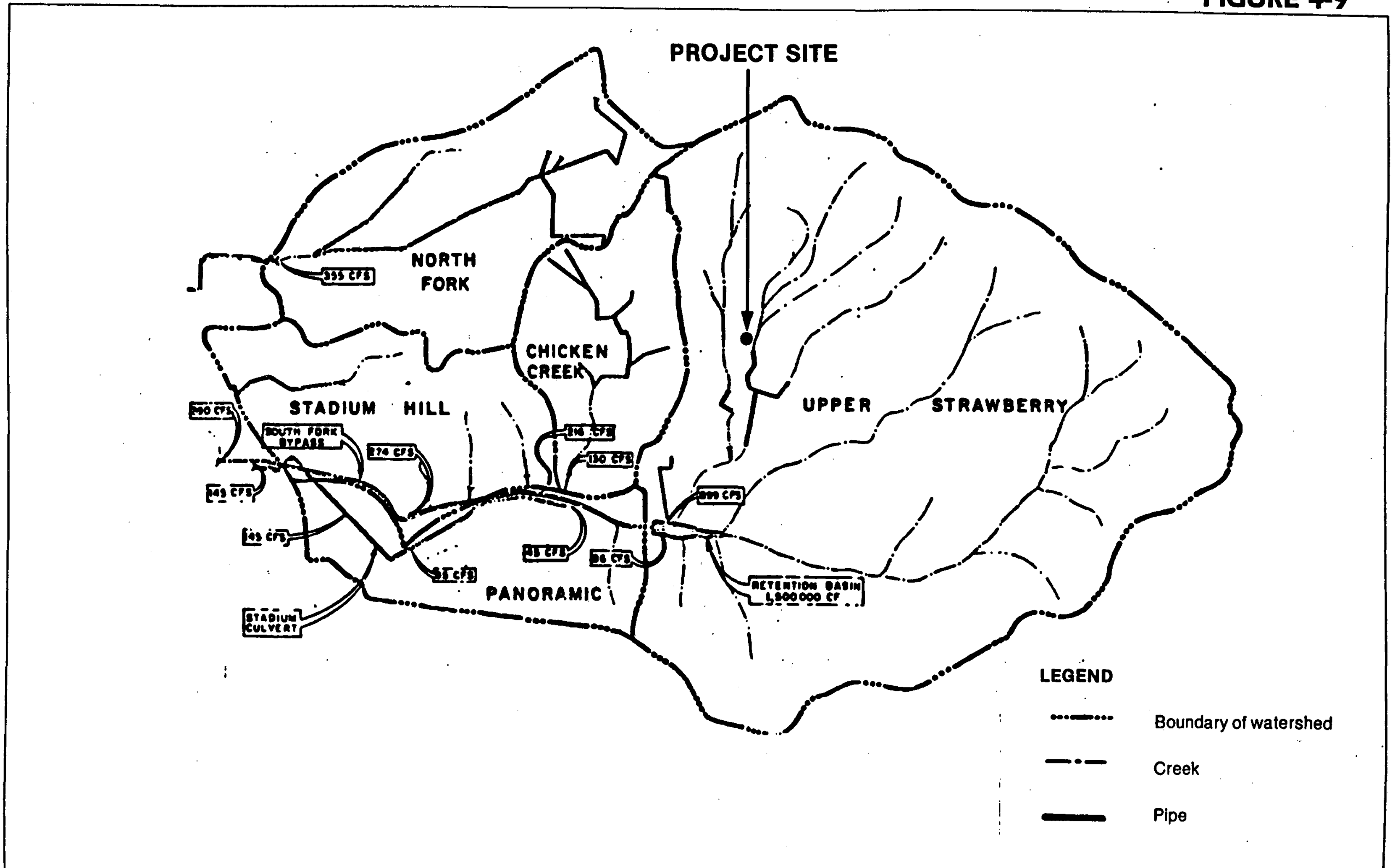
Drainage

The area surrounding the proposed site slopes down toward Centennial Drive in complex slopes ranging from near-level in the lower parking area (below the site) to near-vertical in the old rock cut below the existing biomedical buildings. The overall gradient of the site vicinity is approximately 25 percent, with some of the slopes above the buildings in the range of 50 percent. The stream channel that passes through the western portion of the site has a gradient of about 20 percent. This ephemeral stream flows in a narrow ravine trending approximately north-south, draining a catchment area of about 51 acres.

The stormwater runoff for this type of partially developed, partially landscaped, partially wooded, rock-cored hillside site ranges from a coefficient of about 60 percent for the natural areas to one of about 95 percent for the heavily developed areas.[2,3] Drainage from hillsides above the site flows into natural stream channels which enter culverts below the site, and pass under Centennial Drive and into the Strawberry Creek retention basin. Stormwater runoff from within the site enters the culverts by way of catch basins. An inlet basin protected by primary screens upstream serves the 48-inch storm drain in the Building 74-83 area.

Extensive improvements were made to the drainage system through-out the Strawberry Creek watershed after the heavy damage caused by the storms of October 1962. The current drainage facilities have been able to accommodate all runoff since the improvements were made. The

FIGURE 4-9



STORM DRAINAGE STUDY, STRAWBERRY CREEK WATERSHED AT UNIVERSITY OF CALIFORNIA, LAWRENCE BERKELEY LABORATORY, PREPARED BY G.T. KUNTZ, CONSULTING ENGINEER, FEBRUARY 1980. PLATE I.

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improvements include additional pipe and culvert capacity, a 1.5 million cubic foot retention basin in the Upper Strawberry sub-watershed, trash racks, and "hardening" of stream channels. A safety overflow system from the retention basin called "North Canyon Road Bypass" exists to divert water in excess of the retention basin capacity to the adjacent roadway.

Based on a storm of 100-year recurrence, the existing drainage facilities have been reported to be adequate to handle the peak runoff from the Upper Strawberry Creek watershed.[4] In addition, the impact of LBL development in the watershed is reported to represent a small increment of increased peak flow which would have a negligible effect on the drainage facilities in the Strawberry Canyon watershed.[5]

Water Quality

Because of its location upstream of existing development, the quality of runoff water at the site presently is considered high. Water quality sampling was performed at a point above the retention basin dam previously mentioned as part of the Strawberry Creek Management Plan (1987). Water quality at this location is influenced by drainage from the upper canyon areas via Hamilton Creek as well as Strawberry Creek and its tributaries. Analysis of water samples revealed expected lower levels of dissolved and suspended solids, turbidity, oil and grease, nitrogen and phosphorus, bacteria, metals, temperature, and flow than those found at downstream locations. However, the Plan concluded that wet weather quality of Strawberry Creek was impacted by urban runoff and deteriorated over baseline water quality conditions.[6] Generally, a large percentage of the annual contaminant load collects through the dry summer period and is carried off with the first winter storms.

National Pollutant Discharge Elimination System

Under recent (November 1990) amendments to the regulations contained in 40 CFR 122-124 regarding the National Pollutant Discharge Elimination System (NPDES), stormwater discharge is now regulated through this program. Authority for the NPDES program is found in the Federal Clean Water Act, and in the State of California its enforcement has been delegated to the Regional Water Quality Control Boards (RWQCBs). The State Board adopted a State-wide general permit for industrial stormwater on November 19, 1991.[7] This permit contains stormwater discharge requirements for both municipalities and industrial dischargers in the State. Compliance with the permit conditions will be documented through submittal by dischargers of a "Notice of Intent" form to the RWQCBs, stating the dischargers' intent to comply with the permit. As necessary, more specific permit conditions may be applied to dischargers by the RWQCBs in the future.[8]

LBL is subject to the requirements of the NPDES for stormwater discharge, and to the requirements of the San Francisco Bay Area RWQCB. LBL intends to submit a Notice of Intent form to the Bay Area RWQCB within the appropriate time limit. LBL would thereby be subject to site-wide stormwater discharge requirements as stated in the State-wide permit discussed above. Site-wide stormwater discharge requirements would include discharge from the proposed action site, and no further NPDES requirements are expected to be applicable to the proposed action.[9]

IMPACTS

This section evaluates the action in terms of its potential to: 1) substantially degrade water quality; 2) contaminate a public water supply; 3) substantially degrade or deplete ground water resources; 4) interfere substantially with ground water recharge; or 5) cause substantial flooding. The section also analyzes potential changes in drainage patterns and surface runoff.

The potential hydrologic effects of the proposed are considered from two points of view: the short-term and long-term effects of the action on the environment. In the first category, potential short-term effects of construction are water quality degradation resulting from on-site erosion and subsequent turbidity and sedimentation downstream, as well as from improper storage or disposal of construction materials, chemicals, equipment washdowns, etc. In the second category, action-induced hydrologic changes that could alter water quality or flooding potential at the site or downstream are considered.

Impact

4.6-1 **Construction activities could cause increased erosion at the site and subsequent water quality degradation and/or reduction of storm drainage system capacity.**

During the construction period, the soils at the site could be exposed to the erosive forces of wind and storm runoff. In their present condition the site soils are low to moderately erosion-prone;

however, when devegetated and excavated they would be subject to gullying under the influence of moderate to heavy rains, if preventive action is not taken. Increased on-site erosion could result in adverse effects to downstream water quality and increased sediment transport could reduce the carrying capacity of downstream storm water drainage systems.

The following would limit the action's effect on water quality:
Erosion control measures cited in Section 4.5, Geology, Soils and Seismicity would apply to mitigating potential water quality and storm drainage system effects. In addition, temporary stilling basins would be constructed to trap sediment and prevent it from leaving the site in storm water or washwater runoff.

Disturbed areas at the site would be protected and stabilized as soon as feasible by revegetation and drainage facilities. After implementation of the landscape plan, surface soils would be stabilized and would not constitute a substantial erosion hazard.

Impact

4.6-2 **The action would alter existing drainage at the proposed site and would increase the amount of storm runoff from the site.**

The proposed action would increase the impervious surface at the site by slightly over one acre. This figure represents impervious surfaces from roofs, road, access and yard area surfaces, and other improved areas. The remaining portion of the site would include graded, landscaped areas and areas within the site fenceline that have not been graded as part of the action. The facility comprises about 0.5 percent of the Upper Strawberry sub-watershed. The action would add approximately two percent impervious surface to its catchment basin which is predominantly undeveloped.

Storm runoff volume from the entire 51-acre catchment basin would increase by about 1.3 percent as a result of the action.[10] The actual increased volume of runoff from the site (estimated at 1.5 cfs during the 100-year, 24-hour storm) would be relatively small and would not be expected to cause any substantial adverse impacts on the hydrologic regime of the South Fork of Strawberry

Creek.[11] The percentage increase in peak flow in the Upper Strawberry watershed is estimated to be 0.1 percent.[12]

Drainage facilities for the site are shown on the project Grading and Drainage Plan (Figure 2-7). The plans indicate that it would be necessary to route the ephemeral stream in a culvert where it crosses under the site. It is expected that stormwater velocities in the culvert would be higher than the velocities in an open creek channel. However, the action would include facilities to protect the downstream channel as shown in Figure 2-7. It is not expected that erosion effects would extend into the lower campus area because the flow rate would drop as the water passed through the retention basin on South Fork Strawberry Creek.

The following would limit the impact on drainage and storm runoff:
The replacement HWHF would be constructed with adequate drainage facilities to collect storm water runoff from roofs, sidewalks, parking lots and other hard surfaces, and deliver it to existing channels of adequate capacity to accommodate the flow.

To alleviate potential erosion impacts on the lower reach of the ephemeral stream, the proposed storm drainage systems would be designed to reduce the velocity of post-construction runoff by using energy dissipaters.

Operational Water Quality Impacts

Operation of the replacement HWHF would not create impacts to surface water or groundwater. Hazardous wastes handled by the facility would continue to be transported for approved off-site disposal. Waste oil would be stored in 55-gallon drums in an above-ground storage rack. The structure would have secondary containment which would prevent potential contamination of soil or groundwater. Removal of the waste oil tank at the existing HWHF would be performed in accordance with the LBL HWHF Closure Plan and requirements of Cal EPA and the City of Berkeley, and would include soil and/or water testing by a State-certified laboratory to ensure that on-site water quality is not affected.

The HWHF would be designed using berms, perimeter ditches and closed catch basins to provide containment and prevent contamination of the surrounding environment during an accidental spill of hazardous or radioactive materials. Facility design and operation would be governed by the federal Resource Conservation and Recovery Act, the California Hazardous Waste Control Law, and DOE Orders 5820.2A and 6430.1A. For a more detailed discussion of pertinent requirements, see Section 4.10, Hazardous Materials.

Accident scenarios involving hazardous or radioactive materials transportation at LBL or off-site were analyzed in the Safety Analysis Document (SAD) for this action. These scenarios included potential release of hazardous materials to a storm drain or to a permeable surface. As discussed in the SAD, the potential for water quality degradation by this means is remote because of the safe packaging materials used for transporting wastes and the careful operating procedures employed by the licensed waste haulers, and would not increase as a result of the proposed action.

<u>Impact</u>

4.6-3 **The potential for a hazardous waste spill that could affect water quality would exist from continued handling operations.**

The following would limit the operational impact on water quality:
The facility would be designed and operated in conformance with applicable State and federal hazardous waste regulations and DOE Orders 5820.2A and 6430.1A to secure the loading and storage areas and to prevent contamination of the surrounding environment during an accidental spill of hazardous or radioactive materials. Containment features would be provided as described in Chapter 2, Description of the Proposed Action.

Underground fuel storage tanks located at the facility would be designed, constructed and operated in conformance with the applicable requirements of EPA, Cal EPA and the City of Berkeley Department of Environmental Health. (For a more detailed discussion of applicable underground tank requirements, see Section 4.10, Hazardous Materials.)

CUMULATIVE IMPACTS

Addition of impervious surface from the proposed action would result in an increase in storm runoff from the Life Sciences Research Area that drains into the South Fork of Strawberry Creek. The action would form one acre of the overall four-acre increase in the total amount of impervious surface at the Life Sciences Research Area projected by the LBL LRDP (1987). Full buildout at

LBL, including Life Sciences Research Area development, is not expected to substantially affect the drainage facilities in the Strawberry Creek watershed.[13] The project would not be considered to contribute to a significant cumulative effect to hydrology.

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1 G.T. Kuntz, Consulting Engineer, Storm Drainage Study, Strawberry Creek Watershed at University of California, Lawrence Berkeley Laboratory, prepared for LBL Plant Engineering, February 1980.

2 Runoff coefficient is the percentage of precipitation that appears in surface streams. This value is determined on the basis of climatic conditions and the physiographic characteristics of the drainage basin and usually is expressed as a number between zero and one. (Glossary of Geology, American Geological Institute, 2nd edition, 1980.) Runoff volumes are shown as percentages in the present report for purposes of clarity.

3 Runoff coefficients from ABAG, Manual of Standards for Erosion and Sedimentation Control Measures, 1981, p. 19.

4 Kuntz, op. cit., p. 10.

5 Ibid.

6 Charbonneau, 1987, op.cit.

7 San Francisco Bay Area RWQCB Stormwater Information Line, updated November 20, 1991.

8 Tom Mumley, San Francisco Bay Area RWQCB, personal communication with EIP Associates, August 8, 1991.

9 Ibid.

10 Kuntz, 1980, op.cit.

11 Charbonneau, 1987, op.cit.

12 Kuntz, 1980, op.cit.

13 Ibid.

4.7 AIR QUALITY

SETTING

Regulatory Background (General)

The basic regulatory framework governing the control of air emissions from the proposed HWHF is provided under the federal Clean Air Act. The Clean Air Act directs the EPA to adopt national primary and secondary ambient air quality standards (NAAQSs) for certain "criteria" air pollutants. It also directs the EPA to adopt performance standards for stationary sources of air pollutants and national emission standards for certain hazardous air pollutants (NESHAPs).

While the EPA has independent jurisdiction to enforce federal standards under the Clean Air Act, the law assigns principal responsibility for implementation and enforcement to the states. In California, that responsibility has been delegated to the State Air Resources Board (ARB) and various local air pollution control districts. The district having immediate jurisdiction over most stationary air emission sources located in the Bay Area, including the proposed HWHF, is the Bay Area Air Quality Management District (BAAQMD). The ARB has retained jurisdiction over non-stationary sources (i.e., motor vehicles) throughout the State.

The EPA has adopted primary and secondary NAAQSs for several specific air pollutants known as criteria pollutants. These include sulfur dioxide (SO_2), suspended particulate matter (TSP), carbon monoxide (CO), ozone (O_3), nitrogen oxide (NO_2) and lead. In addition, the ARB has adopted State ambient air standards for these and several other pollutants (hydrogen sulfide, sulfates, and visibility reducing particles). State ambient air quality standards are equal to or more stringent than the federal NAAQSs.

The Bay Area air basin currently is in violation (i.e., non-attainment) of a number of State and federal ambient air quality standards, including the NAAQSs for ozone and CO (urbanized areas only). Ozone is not emitted directly from pollutant sources but instead forms in the atmosphere through a complex series of photochemical reactions involving reactive organic compounds (ROG) and nitrogen oxides (NO_x). No single-source category accounts for a majority of ROG and NO_x emissions in the air basin, and many such sources are spread throughout the Bay Area.

In contrast with ozone, CO is a nonreactive pollutant with one major source: motor vehicles. Ambient CO distributions closely follow the spatial and temporal distributions of vehicular traffic and are influenced strongly by meteorological factors such as wind speed and atmospheric stability.

In addition to ozone and CO, ambient air quality standards for TSP may be exceeded from time to time in the Bay Area. The highest concentrations of TSP tend to occur in dry, inland areas, such as the Santa Clara, Diablo, and Livermore valleys. The largest contributors to TSP levels in the Bay Area are demolition and construction activity and motor vehicle traffic over paved and unpaved roads.

One important consequence of area non-attainment with ambient air standards is its impact on the ability of new or modified emission sources to obtain necessary permits from the appropriate air quality management district. Under BAAQMD rules, any person who builds, installs, modifies or replaces a stationary source usually must obtain a permit from the BAAQMD in the form of an authority to construct (ATC). In addition, such persons must obtain a permit to operate (PTO) before the source can be used. The determination of whether to issue an ATC or PTO depends on whether the applicant can demonstrate compliance with specified emissions standards, or alternatively, that the proposed source will not interfere significantly with the attainment or maintenance of any NAAQS. If the required demonstration cannot be made, the permit will be denied.

There are a number of exemptions from BAAQMD permit requirements. These exemptions are available to different types of specified facilities (e.g., certain office and commercial buildings heated by natural gas) and equipment. However, the exemptions do not apply to any facilities or equipment that emit specified levels of certain hazardous substances, including lead, asbestos (other than in connection with demolition operations or waste disposal), beryllium, mercury, vinyl chloride, fluorides, and certain sulfur compounds.

<u>HWHF Operation</u>

Although the existing HWHF does generate some low-level air emissions, principally associated with on-site, laboratory-scale chemical storage, treatment, and packaging activities, the facility has been allowed to operate without permits issued by BAAQMD. Under BAAQMD rules, facilities that emit air contaminants as a result of the operation of certain types of laboratory and testing equipment and liquid storage and loading equipment generally are exempt from district permitting requirements. Operation of the proposed HWHF will involve similar types and levels of emissions as the existing facility; based on current regulations LBL would not be required to obtain air permits from the district.

The HWHF will be required to comply with various operating standards under both federal and BAAQMD rules. These standards are designed to limit the potential for emissions of certain types of organic and inorganic gaseous pollutants and specified hazardous substances. As noted above, the federal NESHAPS establish specific limitations and requirements on emissions of a variety of hazardous substances, including asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. BAAQMD standards for hazardous substances overlap the federal NESHAPS to a large extent, but do address some additional substances (lead and hexavalent chromium) and entail some differences in application. A compliance agreement with EPA Region IX is in draft form. This agreement commits LBL to developing a monitoring strategy that includes the HWHF and is based on hazardous risk.

The proposed HWHF does have the potential to emit certain substances, including radionuclides, that are subject to specific operating standards. EPA has promulgated NESHAPS for radionuclides emitted from most facilities owned or operated by DOE and other facilities licensed by the Nuclear Regulatory Commission (NRC) or operated by other federal agencies. These NESHAPS include specific emissions standards, monitoring and compliance procedures, and reporting and record-keeping requirements.

As a federally directed facility, LBL is subject to DOE Order 5820.2A regarding radioactive waste management. Certain ventilation systems for radioactive materials handling and storage areas at the existing facility are (and in the proposed facility will be) equipped with High Efficiency Particulate Air (HEPA) filters and contain, in all cases, in-line samplers to control and monitor emissions. There have been no instances of radioactive releases in reportable quantities at the existing facility, and normal facility operation is not expected in the future to generate adverse airborne emissions of radioisotopes.

Regulatory Setting (Toxic Air Contaminants)

In addition to requirements adopted by the EPA, the ARB, and the BAAQMD to implement the federal Clean Air Act, California has adopted special rules applicable to emissions of certain kinds of toxic air contaminants (TACs). TACs are defined by State law to include any air pollutant that may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential threat to human health.

The State air toxics law requires the ARB to identify specific chemical substances that constitute TACs. TACs identified to date include asbestos, benzene, cadmium, carbon tetrachloride, chlorinated dioxins/furans, hexavalent chromium, and ethylene oxide. Other substances that are being (or may in the future be) considered for identification as TACs include inorganic arsenic, vinyl chloride, methylene chloride, chloroform, formaldehyde, nickel, perchloroethylene, and trichloroethylene. The ARB has adopted TAC control measures for benzene (requiring installation of Phase I and II vapor recovery systems at retail motor fuel service stations) and hexavalent chromium (addressing emissions from chrome plating and chloride acid anodizing operations). Additional control measures for other TACs have been considered and may be adopted in the future.

In 1987, the State Legislature adopted a new law known as the Air Toxics "Hot Spots" Information and Assessment Act. This law requires certain facilities to prepare and submit to air quality control districts (e.g., the BAAQMD) a comprehensive inventory quantifying air emissions of over 150 different listed substances. Facilities to which the inventory requirement applies include: 1) those that manufacture, formulate, use or release any certain chemicals (or their precursors); and 2) those that have been listed in an existing toxics use or air toxics emission survey inventory or report issued by an air quality management district. LBL has been included in the air toxics inventory issued by the BAAQMD, and it is expected that LBL will continue to prepare site-wide air emissions inventories periodically as required by the Air Toxics "Hot Spots" legislation.

Under regulations adopted by the ARB, covered facilities that either 1) emit a total of 25 tons per year or more of certain criteria pollutants; or 2) have been listed in a district air toxics inventory report were required to have submitted an emissions inventory by August 1, 1989. Other covered facilities were required to submit inventory reports by August 1, 1990. The reports must include facility plans and detailed emissions data on standard forms approved by the ARB.

Upon receipt of facility reports, the ARB is directed by law to assign covered facilities to priority categories and designate facilities that are required to prepare health risk assessments. Depending on the results of the assessments and other information, the ARB may take further action to control air toxics emissions.

IMPACTS

This section evaluates the proposed action for its potential to violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations. Air quality impacts comprise two categories: temporary impacts due to construction and long-term impacts due to operation. Air emissions from HWHF-generated traffic is considered as an effect of facility operation.

Construction Impacts

Impact

4.7-1 **Construction activities would create short-term increases of dust emissions at the proposed site and exhaust emissions from vehicles related to construction.**

Construction activities would create a temporary increase in dustfall, and therefore an increase in TSP concentrations, near the proposed site. Equipment and vehicles generate dust during clearing, excavation and grading. Construction vehicle traffic on unpaved surfaces also increases dust, as does wind blowing over exposed earth surfaces. Construction vehicles and equipment and worker commute vehicles also would emit exhaust at the construction sites that would contribute to local and regional pollutant concentrations. The amount of the increase would not cause violations of any air quality standards or contribute substantially to an existing or projected air quality violation.

The following would limit the effect of construction activities on air quality:

Dust emissions related to excavation and construction would be reduced by watering. The frequency of watering would increase as wind speeds increase.

The site would be cleaned daily of mud and dust carried onto street surfaces by vehicles during construction.

Measures noted in Section 4.5, Geology, Soils, and Seismicity related to erosion also would apply to reducing dust emissions. Upon completion of construction, replanting and paving would be completed as soon as feasible.

Operational Impacts

The proposed action would relocate existing HWHF activities from one LBL area to another. A net increase in LBL vehicular traffic, employee or operational, is not expected. Since the action would not affect internal and external traffic volumes, no measurable increments to local CO concentrations or to emissions of ROG or NO_X would occur. The quantity of hazardous materials handled by LBL also would not increase as a result of the proposed replacement HWHF, and therefore air emissions from waste handling activities would remain at existing levels.

Storage, treatment and packaging activities would continue to be performed using sealed containers and fume hoods, with radiation areas ventilated by HEPA-filtered fume hood systems with in-line samplers and chemical handling areas covered by fume exhaust hoods at negative pressure. Based on a preliminary review of the conceptual design by the BAAQMD, it is anticipated that BAAQMD permits will not be required for the replacement HWHF operations. At the completion of the design, the replacement HWHF operations will be reviewed in detail by the BAAQMD and any required permits will be obtained.[1] A discussion of potential air emissions during upset conditions is provided in Section 4.10, Hazardous Materials.

Radiological Air Emissions

Some of the activities associated with the handling of hazardous wastes at the HWHF result in the release of small quantities of chemicals into the atmosphere. The amount of chemicals released are in conformance with standard industry practice for facilities of this type. Worker protection standards require that a negative pressure be maintained in radioactive materials handling areas, potentially resulting in venting of radionuclides to the atmosphere, including the potential release of low-level radionuclides (tritium, carbon 14, iodine 125 and iodine 131). Industry standards are designed to ensure that these compounds are released in negligible quantities during decontamination activities.

Approximately 2 curies (Ci) of radioactivity would be processed with the solid and liquid waste through the HWHF annually. Tritium activity is not included in this estimate because it is impregnated in a silica gel and packed in tar and does not become airborne. A substantial portion of the total radioactive materials would be in waste packages and containers that would remain sealed from the point of collection until their off-site disposal.

Quantities of radionuclides and hazardous wastes potentially emitted from the HWHF would be considerably smaller than quantities emitted from laboratory facilities within the LBL complex. Air sampling devices equipped with filters that capture radioactive particulates are used to regularly monitor laboratory emissions and emissions from the three existing stacks at the HWHF. Analysis of samples from laboratory and existing HWHF stacks has demonstrated that radioactivity on the filters has not exceeded background levels.

Environmental releases of radionuclides at the LBL facility have been studied and reported in the 1990 Annual Environmental Monitoring Report by LBL engineers. A detailed meteorological study of Strawberry Canyon was performed by LBL scientists, including five years of hourly wind speed and direction measurements. These wind data have been coupled with emissions data to predict the trajectory of radioactive emissions through the atmosphere. For 1990, as in the previous several years, dose equivalents attributable to LBL radiological operations were a small fraction of both the relevant radiation protection guidelines and the natural background radiation.[2]

Areas of the new HWHF which would present contamination potential are decontamination, solidification, compaction and sorting. Each of these areas would be protected from contamination by glove boxes or exhaust hood enclosures. Where required, exhaust discharge from hoods or glove boxes would pass through a single-stage HEPA filter with a particulate removal efficiency of 99.97 percent for 0.3 micrometer particulate. The release mechanism for the decontamination and compaction areas is assumed to be resuspension; for the solidification operations it would be partitioning activities from liquids.

Released contamination would be minute and would be diluted by the air exhaust flow from the various ventilation zones. The area that would produce the greatest total concentration of radioactive activity at the roof stack is the compaction area. This maximum concentration is estimated to be 3.2×10^{-13} microcuries per cubic centimeter (mCi/cc).[3]

To determine the level of significance of radioactive effluents, the estimated concentrations of the various materials at the point of discharge have been compared to their respective release limits.[4] The concentrations of the discharged radioactive effluents would be at least one order of magnitude below the Maximum Allowable Concentrations. Further reduction of the concentrations by dispersion would occur with increasing distance from the building.

Impact

4.7-2 **HWHF operations would continue to involve generation of low levels of air emissions of radionuclides.**

HEPA filters and in-line samplers would be provided to reduce emissions of radioactive materials and to monitor exhaust air from radioactive handling areas. Air emissions would be maintained below threshold levels determined by statutory requirements.

Air Emissions of Hazardous Chemicals

The handling of hazardous chemicals may potentially release chemicals into the gaseous effluent stream through: 1) the transfer of organic materials from laboratory size containers into 55-gallon drums for off-site disposal, and 2) the neutralization of acid. Chemicals that potentially may be emitted during handling activities include solvents, fixatives, petroleum hydrocarbons, alcohols, and various other organic compounds. All volatile chemicals processed at the HWHF are kept in closed containers, so that the only source of airborne emissions for these chemicals are in transferring liquids from one container to another. These operations would be performed under fume hoods which would maintain negative pressure with respect to the HWHF even in the event of loss of power to the facility. No appreciable amount of chemical fumes could build up inside the facility. No other waste handling operations would produce chemical releases because the chemicals would be sealed in containers at all times.

An estimated maximum five gallons per day of organic solvents would be transferred from small to larger containers.[5] The amount of acid to be neutralized would also be less than five gallons per day. Both processes involve a simple pouring operation using a funnel to prevent spillage. Fume releases, estimated based on the amount of materials evaporated from the exposed surface while being poured, would be mixed with ventilation exhaust air and diluted prior to discharge at the roof stack.

The concentrations of representative materials in the air discharge at the stack would be 3.4 milligrams per cubic meter (mg/m^3) for trichloroethane and 0.4 mg/m^3 for nitric acid. The concentration at ground level downwind, and still within site boundaries, would be less than 0.3 mg/m^3 for trichloroethane and 0.004 mg/m^3 for nitric acid.[6] These values can be compared to the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH 1988). The ACGIH states that it is believed that the average worker can be exposed to the TLV on a daily basis, up to 8 hours per day and 40 hours per week without adverse health effects. The trichloroethane TLV is 1,900 mg/m^3 and the nitric acid TLV is 5 mg/m^3. Although the ACGIH cautions use of the TLV for non-occupational exposures, non-occupational exposure limits are not available. Based on this analysis, there would be no adverse environmental impact from the anticipated concentrations of materials discharged to the outside air.

Total discharge of organics and acids through working loss may be extrapolated from the estimated discharge concentrations. Assuming there are 200 working days in a year, and each one-gallon pour takes two minutes, the total annualized release to the environment would be about 0.8 grams of solvent and 0.8 grams of acid.

CUMULATIVE IMPACTS

The action would not include new employees, new waste handling functions, or a greater volume of wastes handled. Consequently, no increase in air emissions would result from workers' vehicles, waste transportation vehicles, or from handling activities. Emissions from construction vehicles and equipment would constitute a short-term addition to cumulative air emissions sources.

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[1] Judith Cutino, Senior Engineer, BAAQMD, conversation with EIP Associates, May18, 1989.

[2]2. Lawrence Berkeley Laboratory, Environment, Health and Safety Division, Annual Environmental Monitoring Report of the Lawrence Berkeley Laboratory, 1990, May 1991, pp. 1-2.

[3] Please see Appendix C, Technical References to Endnotes for Section 4.7.

[4] Please see Appendix C, Technical References to Endnotes for Section 4.7.

[5] Jim Haley, Deputy Department Head, Operations, LBL EH&S Department, conversation with EIP Associates, September 11, 1989.

[6] Please see Appendix C, Technical References to Endnotes for Section 4.7.

4.8 TRAFFIC AND CIRCULATION

This section discusses existing traffic and circulation patterns at LBL, and access to mass transit, as well as pedestrian traffic, egress and ingress to LBL, and HWHF transportation needs. DOT regulations regarding the transportation and export of hazardous wastes, including designated access routes on local roadways, are also discussed. A detailed analysis of traffic and circulation in the LBL vicinity is contained in the LBL Site Development Plan, Draft Environmental Impact Report, December, 1986 and Final EIR.[1] Pertinent areas of that study are summarized in this section.

SETTING

Automobiles, public transit, bicycles, and walking are available modes of transportation to the area of the proposed action. Regional access to LBL is provided by Interstate 80, State Route 24 and State Route 13 (Ashby Avenue). The Bay Area Rapid Transit (BART) and the Alameda County (AC) Transit serve downtown Berkeley. The UC campus and LBL are connected by a shuttle bus that serves various locations in LBL.

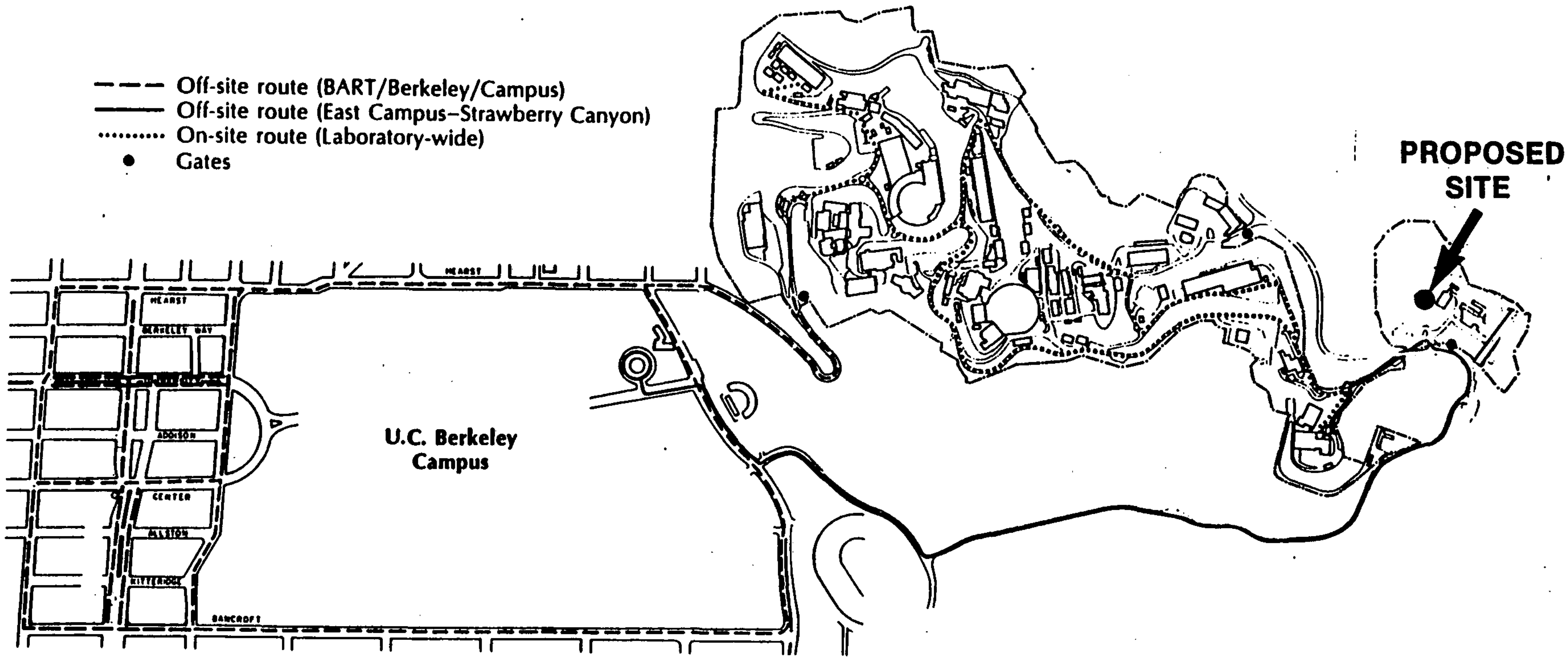
The majority of LBL staff and employees commute by automobile and travel via surface streets to one of three gates to the LBL site. All three gates have security-controlled access; approximately 30 percent of LBL traffic uses the Strawberry Canyon Gate, adjacent to the Life Sciences Research Area (Figure 4-10).

LBL Circulation

The LBL site is served by a serpentine roadway system oriented from east to west. Because of circulation constraints, most large truck deliveries are directed to LBL's Emeryville warehouse, where materials are transferred to smaller trucks for delivery to the LBL site. The Laboratory's policy is to encourage the use of public transit and the LBL shuttle as the primary means of travel to and within the site. Foot travel is encouraged for trips within LBL through a system of footpaths and walkways. Cyclotron Road is the main east-west road within LBL and is a major internal circulation route. Cyclotron Road is complemented by a northern road loop and a southern road loop. The loop portions are one lane designated one-way to facilitate traffic flow and minimize congestion. Where the road carries traffic in two directions, it has two lanes. Cyclotron Road terminates at the Life Sciences Research Area as shown in Figure 4-10.

MAJOR TRAFFIC ROUTES - LBL SITE

FIGURE 4-10



SOURCE: LBL LONG RANGE DEVELOPMENT PLAN (AUGUST 1987)

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Life Sciences Research Area

Access to the site of the proposed facility is gained either through the Strawberry Canyon Gate on Centennial Drive, or using Cyclotron Road and the underpass below Centennial Drive. An existing roadway within the Life Sciences Research Area passes between Buildings 83 and 74 and terminates behind Building 83. The existing access road is primarily used by delivery trucks serving the biomedical facilities.[2]

Parking at LBL is limited because of the LBL's hilly terrain. Parking demand generally exceeds the number of available spaces. However, the demand/supply ratio of parking space at the Life Sciences Research Area is generally superior to other LBL locations.

Existing HWHF Traffic and Circulation

There is an average of six trips per day by pick-up truck or van to the existing HWHF facility. Approximately ten trips are made per year by tractor trailer carrying wastes from the LBL facility to approved off-site disposal facilities. The site of the existing HWHF is some distance from any State routes, and the contribution of the facility to total traffic on these routes is considered negligible.

Hazardous waste transportation routing is designed to reduce potential exposure to waste materials. Federal regulations addressing this issue are set forth in Title 49 CFR 397.9.[3] State law for the transportation of waste is contained in the California Vehicle Code, which states that the transfer of waste materials shall be on state or interstate highways which offer the least overall transit time.[4] The route currently used passes through LBL and exits at the Blackberry Canyon Gate. Trucks proceed down Hearst Street to connect with University Avenue and travel west to I-80 before heading north or south.

Potential alternate routes include Centennial Drive and Grizzly Peak Boulevard. Centennial Drive is a steep public roadway with tight curves which can experience poor visibility and fog. Grizzly Peak Boulevard provides access to Route 24 to the east. However, it is a two-lane highway with sharp curves and long downhill runs to the interstate highway. The current transfer route is preferred to other routes that involve the use of public roads in the vicinity of the proposed site and use of alternative routes is not recommended or planned.

IMPACTS

This section evaluates the proposed action in terms of its potential to cause a substantial increase in traffic relative to the existing traffic load and capacity of the street system. Increases in traffic volume that reduce intersection capacity to below Level of Service D are considerred significant adverse impacts. Increase in traffic volumes of more than two percent for intersections currently at Level of Service E or F are also considered significant adverse impacts. The degree of change in the frequency of hazardous waste transfer operations on public roads is also considered as a criterion for potential adverse effects.

Off-Site Hazardous Waste Transportation

Impact

4.8-1 **Trucks transferring wastes would continue to access public streets and highways.**

There would be no increase in the volume of hazardous waste from the replacement facility, and on a yearly basis there would be no increase in the number of trips made by transfer vehicles or frequency of service. The transfer of wastes to an approved off-site disposal area would continue to occur approximately ten times per year. Approved disposal sites are located in Utah, Nevada, Washington, or elsewhere in California. The routes used for the transfer of wastes from the proposed facility to the disposal site would continue to be generally over interstate highways. The routes used would not differ from routes currently used for the transfer of hazardous waste materials from LBL.

The following would limit the impact of continued use of public streets and highways:

The operation of transfer trucks would continue to be carried out in compliance with all applicable State and federal regulations including Title 49 CFR 397.9 and Title 26 of the California Vehicle Code.

The transportation of materials from the HWHF would not have an increased impact on areas through which trucks currently pass. The Level of Service at intersections around LBL would remain unchanged as a result of the action.

LBL Circulation

Because the proposed facility would not result in an increase in the volume of hazardous waste handled at LBL, the number of daily deliveries and transfer truck departures would not be greater than at the existing facility. The new HWHF would not result in an increase in truck traffic on LBL roads, including Centennial Drive and Cyclotron Road. Hazardous waste would continue to be transported to the facility along internal roadways within LBL. Vehicles would use Cyclotron Road and pass under Centennial Drive to access the Life Sciences Research Area and the replacement facility. Circulation within LBL would not be affected by the minor amount of internal redistribution which would take place.

There would be a maximum of ten staff members assigned to the proposed facility. The same number of personnel presently employed in waste handling operations would be transferred to the relocated facility. Since the number of employees at LBL would not increase as a result of the action, there would not be an increase in overall parking demand on the LBL site. Parking in the Shop and Support Facilities Area, where the existing HWHF is located, may be slightly improved. The action would improve congestion and site access to the Shop and Support Facilities Area in that it would involve removing existing facility activities from this crowded area.

Impact

4.8-2 **The action would remove some vehicular congestion at the existing HWHF site and facilitate access to the Shop and Facilities Support Area.**

This is considered a beneficial impact of the proposed action.

Life Sciences Research Area

Construction plans involve providing access to the HWHF by the extension of the existing road between Buildings 74 and 83. The road would gain elevation and turn north beyond Building 83 as shown in the site plan (Figure 2-3). This route would minimize the grade required to gain access to the proposed facility. The road would be engineered to accommodate 60-foot tractor trailers used for transferring hazardous waste.

The maximum grade for the new access road would be 12.5 percent to accommodate 60-foot long semitrailers. The traffic index for the road construction would be 4.5 for automobile areas and 8.0 for trucks. The movement of trucks on the access road would require the appropriate structural requirements to be factored into the road design. The subgrade would have an "R" value recommended by a Civil Engineer.

Impact

4.8-3 **The action would include construction of an access road to serve vehicles transporting hazardous wastes.**

Design of the access road would comply with the Caltrans Highway Design Manual.

Development of the proposed facility would provide new on-site parking for employees working in the facility. The existing parking lot located west of the Strawberry Canyon entrance gate would not be disturbed by the project and would continue to serve the occupants of the immediate area.

Construction Impacts to Transportation and Parking

Short-term transportation impacts generated by the proposed action would include vehicle trips by workers to and from the site, truck trips related to construction, and vehicle trips related to transfer of operations. Trucks would bring building materials to the site and remove excess materials (i.e., earth materials, cleared vegetation) to an off-site landfill. Most truck trips would be involved in the removal of excess materials created by cut and fill operations. During an estimated 3-month period, about 20 truck trips per day would be needed for this purpose. A total of about 290 truck trips would be needed to import concrete at a later stage of the construction process which would not overlap the site work phase.

Construction activities would create temporary parking demand for workers' vehicles and would cause a short-term increase in vehicle traffic on the LBL site and on City access roads. These effects would not conflict with any regulations or policies relating to transportation and parking and would not otherwise be considered adverse impacts. Parking for workers' vehicles would be restricted to the construction and staging areas and would not produce a substantial effect on parking elsewhere at LBL.

Transfer of operations from the existing to the replacement HWHF is described in Chapter 2 of this document under the heading "Closure Plan for Existing HWHF." The transfer of operations would produce an estimated four to six truck trips per day on an LBL roadway between the two facilities for about two weeks. This number of vehicle trips would not create an effect on vehicle circulation at LBL discernable from the effect of the 1,000 to 2,000 vehicle trips per day that occur within the boundaries of LBL. Hazardous wastes transferred to the replacement HWHF would be packaged for shipment in accordance with the existing established procedures for transfer of hazardous materials from LBL generator locations to the HWHF.

Impact

4.8-4 Construction would create short-term increased construction vehicle traffic at LBL and on City access roads.

The construction contract would strongly urge carpooling to limit the number of vehicle trips per day and to reduce parking demand.

CUMULATIVE IMPACTS

The action would not increase the number of HWHF employees, or the volume of waste handled or transported off-site for disposal. Existing waste volumes would continue to be handled by HWHF personnel transferred to the replacement facility. The action therefore would not create a long-term cumulative impact related to traffic or parking.

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1 Director's Office, Health and Safety Liaison, Lawrence Berkeley Laboratory Site Development Plan, Draft Environmental Impact Report, December 1986.

2 Ibid., p.121.

3 U.S.Department of Transportation, Title 49, CFR 397.9, 262 and 263.

4 California Vehicle Code, Section 31303.

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4.9 NOISE

SETTING

Noise is defined as an unwanted and disturbing sound. The human response to environmental noise is subjective and varies considerably from individual to individual. The effects of noise can range from interference with sleep, concentration, and communication, to physiological and psychological stress, and, at the highest intensity levels, to hearing loss. Sleep disturbance occurs when interior noise levels exceed 40 to 50 A-weighted decibels (dBA).[1]

The passage of a heavy truck can generate sound in excess of 90 dBA. A jet airliner takeoff at a distance of 200 feet amounts to about 120 dBA. The California Department of Health recommends 60 dBA as the maximum acceptable average outdoor noise level in noise-sensitive areas (e.g., residential neighborhoods, areas near hospitals and schools, etc.).

The major sources of urban noise are traffic-related. Noise levels in the vicinity of LBL, with the exception of areas bordering major arterials, are relatively low. Located in the Berkeley Hills, the site of the proposed action is some distance from major roadways. The dominant noise sources are LBL traffic using Cyclotron Road and vehicles using Centennial Drive, a public roadway.

Operation of the existing HWHF presently does not produce a substantial amount of noise either in the facility areas or in adjacent areas. The ten tractor trailer trips that the HWHF generates are the greatest source of noise related to facility operation. Because the trips are infrequent and the haul vehicles maintain sound suppression equipment (i.e., adequate mufflers), these tractor trailer trips are not considered to substantially affect nearby receptors.

IMPACTS

In this section the project is examined relative to its potential to increase the ambient noise levels for adjoining areas. This section analyzes potential noise generation from project construction and replacement facility operation.

Construction Noise

Construction activities would temporarily generate high noise levels on and around the site during some construction activities. Table 4-1 shows outdoor noise levels likely to be experienced during

TABLE 4-1
TYPICAL CONSTRUCTION NOISE LEVELS AT 50 FEET (dBA)[1]

Construction Phase	Commercial/Industrial Construction Average Noise Level	Housing Construction Average Noise Level
Groundclearing	84	84
Excavation	89	88
Foundations	78	81
Erection	85	82
Finishing	89	88

[1]Taken from Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, prepared by Bolt, Beranek, and Newman for the U.S. Environmental Protection Agency, December 31, 1971, p. 20.

construction phases. Table 4-2 illustrates typical construction equipment noise. Noise from localized sources typically falls off approximately 6 dBA with each doubling of distance from source to receptor when the receptor is located on a flat plane.

Receptors located within about 1,400 feet of construction would experience noise greater than 60 dBA during the noisiest phases of construction. No noise-sensitive receptors fall within this range. Since the area of the project site is surrounded by wooded hillsides, noise attenuation would be greater than under "typical" conditions. Construction noise impacts would be of short duration.

Project construction would also involve a substantial number of truck trips to and from the site in order to transport excess earth materials off-site and construction materials to the site. These trips would add to noise levels along the vehicle routes. The exact routes used by construction vehicles would vary depending upon the origin or destination of the vehicles and are not presently known. However, it is expected that vehicles primarily would utilize the routes shown on Figure 4-10 in Section 4.8, Traffic and Circulation.

TABLE 4-2
TYPICAL CONSTRUCTION EQUIPMENT NOISE (dBA)[1]

Equipment Type	Noise Level at 50 Feet: Without Noise Control	Noise Level at 50 Feet: With Feasible Noise Control[2]
Earthmoving:		
Front Loaders	79	75
Backhoes	85	75
Dozers	80	75
Tractors	80	75
Graders	85	75
Trucks	91	75
Pavers	89	80
Materials Handling:		
Concrete Mixers	85	75
Concrete Pumps	82	75
Cranes	83	75
Stationary:		
Pumps	76	75
Generators	78	75
Compressors	81	75
Impact:		
Pile Drivers	101	95
Jack Hammers	88	75
Pneumatic Tools	86	80
Other:		
Saws	78	75
Vibrators	76	75

[1]Taken from Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, prepared by Bolt, Beranek, and Newman for the U.S. Environmental Protection Agency, December 31, 1971.

[2]Estimated levels obtainable by selecting quieter procedures or machines and implementing noise control features requiring no major redesign or extreme cost.

Residential areas located along Hearst Avenue would be subjected to noise from construction vehicles accessing the LBL site. Construction activities would be conducted during daylight hours when the existing noise levels due to Hearst Avenue traffic are relatively high. The contribution of construction-related vehicles to existing noise levels on Hearst Avenue and other City roads (e.g., University Avenue) would not constitute a substantial addition to ambient noise levels.

Impact

4.9-1 **Construction would create increased short-term noise levels at the adjacent Buildings 83 and 74 area, and along the routes used by construction vehicles.**

Construction equipment, including construction vehicles transporting materials on- and off-site, would be fitted with sound suppressant devices to control noise volumes to the degree shown feasible in Table 4-2.

Operational Impacts

The facility design would include exhaust fans at roof level and an outside standby generator. The generator would only function during power failures. Noise from exhaust fans or from the standby generator would not be of sufficient volume to affect noise-sensitive receptors outside of LBL. No noise-sensitive areas exist in the vicinity of the replacement HWHF.

Future noise levels on and around the HWHF site would be influenced by action-induced changes in traffic circulation patterns on the internal LBL road system. Since the action is planned as a replacement for an existing facility, it would generate no new internal trips; about six pick-up trucks per day, which now carry waste to the existing facility, would bring wastes to the new facility from other LBL locations. A similar number of trips made by relocated employees would occur at the new facility. The proposed rerouting would not measurably affect average ambient noise levels on LBL property.

Wastes stored at the replacement facility would be removed periodically. It is estimated that ten trips per year by heavy trucks would continue to be required to carry the wastes to a disposal site. The trucks would reach the site via the main LBL campus and depart along Cyclotron Road (see

Section 4.8, Traffic and Circulation). For approach and departure, transfer trucks would use Hearst and University Avenues as access routes to the I-880 Freeway (via I-80).

Heavy trucks can generate noise of about 80 dBA at 50 feet when traveling at 30 mph. Noise at a comparable level can also be generated when such trucks labor uphill at slower speeds or when they apply brakes on a steep downgrade. However, trucks engaged in the transfer of waste materials presently use LBL roads and public streets. Trucks accessing the proposed facility would use the same route. The proposed action therefore would not result in an increase in existing truck noise.

Occupants of Buildings 74 and 83 could be affected by the noise of heavy trucks arriving and leaving the project area. These trucks can generate maximum noise levels approaching 90 dBA at 50 feet. Most receptors in the Buildings 74 and 83 area would be indoors and would experience attenuated noise levels. The limited number of times that transfer trucks would access the site would not result in a substanital adverse noise impact on site users.

Impact

4.9-2 Facility operation would involve exhaust fans and periodic tractor trailer trips that would elevate noise levels in areas adjoining the site.

The following would limit the action's operational impact on noise:
Noise suppression features would continue to be maintained on transfer vehicles.

Exhaust fans would be contained in a mechanical penthouse that would reduce noise emission.

CUMULATIVE IMPACTS

The action would not change the nature of HWHF operations and would not increase the amount of noise generated by facility activities. Noise associated from facility operations (i.e., equipment and transfer vehicle noise) would be relocated from the area of the existing HWHF to the area of the replacement facility. The action therefore would not result in a cumulative operational noise impact.

During construction, the use of trucks to transport materials to and from the proposed site would create a short-term effect on cumulative noise levels along the routes followed by the vehicles. These routes include both LBL roads and public streets. However, HWHF construction activities would be performed during daylight hours when noise from construction vehicles would contribute a minor increment to total ambient noise levels.

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[1] For a discussion of acoustic fundamentals, see Appendix D of this report.

4.10 HAZARDOUS MATERIALS

SETTING

The hazardous wastes handled at the LBL HWHF include a wide range of chemical substances with a broad variety of associated hazards. Wastes originate from the many different research laboratories within the LBL facility. The categories of hazardous wastes handled consist of radioactive and mixed radioactive wastes, PCBs, corrosive liquids, waste solvents, metal sludges, waste oils, waste coolant, waste empty drums, contaminated soils, fluorescent light bulbs, motor vehicle batteries, lab packs, mercury waste, paint materials, oily rags, spent activated carbon and asbestos. No biomedical or infectious waste is handled at the HWHF.

The HWHF does not dispose of wastes, but rather stores wastes and prepares the wastes for transport to off-site TSDFs. Preparation may include combining compatible wastes, sealing radioactive materials in a tar matrix, solidifying, and neutralizing acids. The LBL EH&S Department has Material Safety Data Sheets (MSDS) on file for the chemicals used throughout the LBL facility. Table 4-3 presents a list of the hazardous wastes to be handled at the facility and the annual average quantity handled. These wastes correspond to those listed in the Operation Plan for the facility. The radioactive elements handled at the HWHF and rate of generation are detailed in Table 4-4.

Regulatory Setting

A number of regulatory programs have been enacted to ensure the safe management of hazardous materials and hazardous wastes. It is the policy of LBL to manage its hazardous materials and hazardous waste in accordance with all applicable laws. This section describes the principal hazardous material and hazardous waste programs that may apply to the HWHF. Each program defines the particular substances covered. Citations to the relevant statutes and their implementation regulations are provided in Table 2-1.

Hazardous Materials Management Planning

Both the federal government and the State of California have adopted community right-to-know laws to ensure that the public and local emergency response personnel are provided with information about hazardous materials that are used, stored, or released into the environment by facilities in their communities.

TABLE 4-3
HAZARDOUS WASTE MATERIALS LIST

Description	Chemical Composition	Estimated Amount Handled Per Year
Solidified Metal Sludge from Plating Shops (toxic metals)	Typically Contains Metals of Chromium, Zinc, Nickel, Copper, Cadmium and Lead	3,000 pounds (lbs.)
Wastewater Sludge	Same Metals as Above	150 gallons (gal.)
Spent Plating Solutions and Acids (corrosive liquids)	Nitric, Chromic and Sulfuric Acids, Etchant Solution, Metals	5,000 gal.
Lab Pack-Drummed Waste (poisonous solids)	Arsenical Compounds, Gallium Arsenic-and Thallium-Contaminated Items (plastics, glass, etc.), Cyanide Compounds, Osmium Wastes. Laboratory Chemical Containing Na, P, Cl, Mg, Zn, Al, Ni, Ag, K, Fe and S. Oxides and Halides of Ge, Al, B, Bi, Dy, Eu, Er, Sm, Hg, Ti and Zn. Hydroxides, Sulfates and Sulfides, Ni-Cd Batteries.	5,000 lbs.
Petroleum Products	Waste Oil and Fuel Oil	4,100 gal.
Contaminated Oil and Liquid Waste (carcinogenic liquids)	Polychlorinated Biphenyls (PCBs), PCB-Contaminated Waste Oil and Other Liquids	8,300 gal.
Solvents	Halogenated and Aromatic Solvents, Ethers, Ketones, Alcohols, Freon and Trichloro-Ethane	3,000 gal.
Other Waste	Alcohol, Freon, Resin Solution	350 gal.
Bulk Hazardous Materials (carcinogenic and\or poisonous)	Diesel- and Oil-Contaminated Machinery Parts	1,500 lbs.
	Diesel-Contaminated Soil[1]	0 to 14,000 lbs.
	Asbestos[1]	1,000 to 14,500 lbs.

TABLE 4-3 (Continued)

Description	Chemical Composition	Estimated Amount Handled Per Year
Reactive Metals	Alkali Sodium, Lithium, Potassium and Calcium	20 lbs.
Waste Empty Drums	Contaminated with Solvent, Oil or Corrosive	310 drums
Crushed Fluorescent Light Bulbs	Contaminated with Mercury	12,460 lbs.
Flammable Solids	Ethidium Bromide Waste (plastic, paper, solidified products, etc.), Mineral Oil Absorbed with Superfine (diatomaceous earth), Resin, Waste Organics Compounds, Phenol and Phenol-Contaminated Items	1,000 lbs.

[1]The amounts given for diesel-contaminated soil and asbestos are approximations. The actual amount of these substances handled annually at the HWHF varies widely depending on the quantity that is discovered and/or designated for removal.

TABLE 4-4
ESTIMATED RADIOISOTOPIC INVENTORY IN THE
HAZARDOUS WASTE HANDLING FACILITY

Isotope	mCi	Isotope	mCi
14C	104	237Np	4
32P	41	238U	0.1
35S	35	238Pu	1
59Fe	1	239Pu	7
68Ge	9	242Pu	2
85Sr	748	241Am	2
99mTc	571	243Am	2
106Cd	16	248Cm	1
111In	2	249Cf	6
118Te	214		
123I	59		
125I	120		
131I	27		
204Tl	10		
228Th	4		
232Th	6		

[1]A millicurie (mCi) equals one one-thousandth of a curie.

Note: The amount of radioactive materials handled per year equals approximately one turnover of inventory. Total activity of absorbed tritium handled annually is estimated at 20,000 curies (Ci). Estimated total activity of the above isotopes handled annually is 2 Ci.

The federal Emergency Planning and Community Right-to-Know Act establishes a number of different reporting requirements for owners and operators of facilities where hazardous materials are present. These requirements include submission to local and State agencies of MSDSs and emergency and hazardous chemical inventory forms and submission to EPA and designated State officials of toxic chemical release forms showing releases of these substances into the environment on an annual basis. The law also requires prompt reporting to local emergency planning officials of hazardous substance releases beyond facility boundaries.

The California Hazardous Materials Release Response Act of 1985, which is broader in scope than the federal law, requires that businesses that handle hazardous materials in certain quantities establish and implement a business plan for emergency response to a release or threatened release of the material in accordance with regulations promulgated by the State Office of Emergency Services (OES). For purposes of these requirements, the term "business" encompasses any employer, including State agencies and, to the extent authorized by law, the federal government.

Business plans must include an inventory of information concerning the type and quantity of hazardous materials handled by the business, together with emergency response plans and procedures for use in the event of a release or threatened release of a hazardous material. The law also provides that handlers of hazardous materials must immediately report any release or threatened release of hazardous materials to the OES and provide appropriate governmental health and safety officials with access to the handler's facilities in the event of such releases.

It is LBL's policy to comply with all applicable community right-to-know requirements.

<u>Worker Safety</u>

The federal Occupational Safety and Health Administration (Fed/OSHA) is responsible for ensuring worker safety and work practices under the federal Occupational Safety and Health Act. The OSHA regulations contain standards addressing hazardous materials handling and storage, including workplace conditions, hazard communication, safety training, monitoring, employee protection requirements, first aid and fire protection.

DOE has entered into a memorandum of understanding with Fed/OSHA which provides that DOE will implement OSHA requirements at DOE facilities through DOE orders. DOE has also adopted DOE Order 5480.11, which provides radiation protection standards and requirements to provide protection of workers from ionizing radiation consistent with approved guidance and as far below limits promulgated in the order as reasonably reachable.

Activities at the replacement HWHF will be conducted in accordance with the OSHA requirements and radiation protection standards and requirements, as specified in the applicable DOE orders.

Waste Management

Hazardous Waste. The federal Resource Conservation and Recovery Act (RCRA) establishes a "cradle to grave" hazardous waste regulatory program administered by EPA. The California Hazardous Waste Control Law (HWCL) establishes a similar State program administered by Cal EPA. Both programs regulate the generation, transportation, treatment, storage and disposal of hazardous waste to ensure protection of human health and the environment. California is seeking authorization from EPA to implement its program in lieu of RCRA, but until EPA approves the California program, both the State and federal hazardous waste laws apply in California.

Under both RCRA and HWCL, a waste is characterized and regulated as hazardous if it is listed as such or demonstrates one of four hazardous characteristics: ignitability, reactivity, corrosivity or toxicity. Generators of hazardous waste are responsible for determining whether their wastes are hazardous to ensure that they are managed in accordance with the applicable transportation, treatment, storage and disposal requirements.

Both programs track hazardous waste from "cradle to grave" through use of a hazardous waste manifest system. Whenever hazardous waste is transported off-site, it must be accompanied by a manifest, which contains sections that must be completed by the generator, the transporter and the off-site treatment, storage or disposal facility. Under the HWCL, off-site shipments of hazardous waste must be undertaken only by registered hazardous waste haulers.

Both programs also require permits for facilities engaged in the treatment, storage or disposal of hazardous waste to ensure that these facilities meet minimum standards for the safe management of hazardous waste. The regulations establish general facility standards for waste analysis, security, inspections, personnel training and site location. The regulations also require facility design, operation and maintenance to minimize the possibility of fire, explosion or accidental release, and contingency plans and emergency procedures to minimize the effects of such events. In addition, the regulations require environmental monitoring or groundwater monitoring for certain types of waste management units and appropriate facility closure.

The regulations also contain specific standards for particular types of waste management units to protect human health and the environment. Unit-specific standards pertinent to the HWHF address safe waste management in containers and tanks. The container standards include provisions for waste compatibility, inspection, management of containers to prevent rupture or leakage, and impervious containment systems. The tank standards include provisions for waste compatibility, inspection, structural integrity, secondary containment, and prevention of and response to leaks or spills.

LBL was granted a permit to operate the existing HWHF on November 7, 1983. LBL is applying for an amended facility permit from Cal EPA and EPA for the replacement HWHF and approval of a Closure Plan for the existing HWHF. LBL would construct and operate the replacement HWHF and close the existing HWHF in accordance with the permit conditions, the approved Closure Plan, and all applicable hazardous waste requirements.

Radioactive and Mixed Waste. Policies and requirements applicable to management of radioactive wastes (including mixed radioactive wastes) and radioactively-contaminated facilities for DOE under the Atomic Energy Act of 1954, as amended, are set forth in DOE Order 5820.2A. LBL generates three radioactive waste types covered by the order: transuranic waste, low-level waste and accelerator-produced radioactive material (APRM). If the radioactive waste also contains hazardous components as defined under RCRA, the waste is a "mixed waste" and must also be managed in accordance with the hazardous waste management requirements.

DOE Order 5820.2A generally provides that radioactive and mixed wastes shall be managed to protect human health and safety and the environment in a manner that minimizes the generation of such wastes and in compliance with all applicable health and safety and environmental laws and DOE requirements.

For transuranic waste, DOE Order 5820.21 requires appropriate waste classification and waste reduction measures; when feasible, treatment to destroy the hazardous waste component; packaging that meets DOT and other applicable requirements and storage consistent with the RCRA requirements. These include requirements for waste segregation; protection from unauthorized access; monitoring to ensure against radioactive or hazardous constituent releases; facility design, maintenance and operation to minimize the possibility of fire, explosion or accidental release; contingency plans to minimize impacts of such events, and storage to maintain radiation exposures as low as reasonably achievable. Transuranic waste shipment must comply with DOE and DOT regulations pursuant to DOE Order 1540.1.

DOE Order 5820.2A requires that low-level waste be managed using the most appropriate combination of reduction, segregation, treatment and disposal practices, and provides for implementation of measures to protect public health and safety in accordance with applicable standards and to prevent exposure above limits specified in the order. Low-level waste is also subject to requirements for appropriate waste classification, certification and treatment to meet acceptance criteria of the off-site disposal facility, packaging to meet DOT requirements and DOE Order 1540.1, environmental monitoring in conformance with DOE Order 5484.1, quality assurance and record-keeping.

Under DOE Order 5820.2A, small quantities of APRM may be managed as low-level waste, while larger quantities must be managed pursuant to 40 CFR Part 192 guidelines.

Land disposal restrictions included in RCRA apply to mixed waste generated at LBL. LBL is currently in the process of characterizing its mixed waste in order to determine proper disposal procedures. Depending on the results of the waste characterization, some of the waste included as mixed waste may be subject to land disposal restrictions, and some may not. Those wastes which are subject to land disposal restrictions will continue to be stored until an approved disposal method is available. LBL estimates that the site generates approximately 60 55-gallon drums of mixed waste annually.

Closure of the existing HWHF and construction and operation of the replacement HWHF would be conducted in accordance with all applicable radioactive and mixed waste management requirements.

Special Wastes. In addition to the requirements for the management of the general categories of hazardous waste, radioactive waste and mixed waste, there are special regulatory programs that apply to wastes containing polychlorinated biphenyls or asbestos.

Polychlorinated Biphenyls (PCBs): PCBs are organic oils that formerly were placed in many pieces of electrical equipment, including transformers and capacitors, primary as electrical insulators. In 1979, EPA banned the use of PCBs in most new electrical equipment and began a program to phase out certain existing PCB-containing equipment.

Pursuant to the Toxic Substances Control Act (TSCA), EPA has promulgated regulations applicable specifically to PCBs, including regulations governing the marking of certain PCB-containing items and storage and disposal of PCBs and PCB-containing equipment. The replacement HWHF would comply with the PCB storage regulations, and PCB wastes would be disposed of off-site at facilities in compliance with TSCA PCB regulations.

In addition, PCBs are regulated as hazardous wastes in California under the HWCL administered by Cal EPA. As with other hazardous waste management practices at the replacement HWHF, PCB waste management would be in conformance with the Cal EPA hazardous waste regulations.

Asbestos: Various federal and State regulations apply to the handling, transport, and disposal of asbestos-containing waste materials (ACWM). (As a general matter, ACWM is any friable material that contains 1 percent or more asbestos by weight.) While ACWM is not considered to be a hazardous waste per se under federal law, it is under State law, and its handling and disposal is subject to regulation by EPA as a hazardous air pollutant.

ACWM must be properly wetted and containerized when being transported for disposal. When more than 50 pounds of ACWM are being disposed of, a registered hazardous waste hauler must be used and the shipment must be accompanied by a properly completed hazardous waste manifest. Waste containers must be labeled conspicuously with cautionary language specified by State regulation. While ACWM can be disposed of at any landfill which has waste discharge requirements issued by the regional water quality control board authorizing it, many landfills require compliance with special requirements (e.g., for bagging the material in plastic or containing in 55-gallon drums) before accepting ACWM for disposal.

LBL manages all ACWM in accordance with the applicable requirements.

Transportation

Under the Hazardous Materials Transportation Act, DOT has broad regulatory responsibility for safety in transportation of hazardous materials, including hazardous and radioactive wastes. DOT also derives regulatory authority over radioactive waste transport from the Atomic Energy Act, as amended, and the Department of Energy Organization Act. DOT regulations require that shippers appropriately classify, package, mark, label, placard and provide shipping papers for all hazardous materials shipments. Additional requirements for packaging of radioactive wastes are provided in regulations promulgated by the Nuclear Regulatory Commission, and hazardous wastes must be accompanied by an RCRA manifest.

Carriers must transport hazardous materials shipments in accordance with DOT rules, and report and respond appropriately to spills and other emergencies. DOT also prescribes requirements for safe routing of hazardous materials shipments under the Motor Carrier Safety Act of 1984. Under the California Vehicle Code, the CHP administers a similar program to ensure safety in the transportation of hazardous materials. In addition to the types of requirements described above, the program includes licensing and registration requirements.

All hazardous wastes handled at the LBL HWHF are prepared for shipment and shipped in accordance with all applicable transportation requirements.

Underground Storage of Hazardous Substances (Materials and Wastes)

Subtitle I of RCRA establishes a regulatory program for UST storing hazardous substances, including petroleum. EPA has promulgated UST standards under RCRA Subtitle I that address tank design, construction, monitoring, operation, release response, and closure and financial responsibility requirements for tank owners and operators. There is no permit requirement in the

RCRA Subtitle I UST program. However, UST for hazardous substances must meet the requirements contained in 40 CFR 281.33(e).

California has its own statute governing hazardous materials storage in UST, including the storage of diesel fuel. The statute and its implementing regulations require permits for operation of UST storing hazardous materials and specify requirements for tank design, construction, installation, monitoring operation, release response and closure. The California requirements vary in many ways from the federal regulations and until California receives authorization to implement its program in lieu of the federal program, tanks in California must comply with both sets of requirements.

The California Underground Storage Tank Law is administered locally by cities and counties. Under a memorandum of agreement with the City of Oakland, the City of Berkeley Toxics Management Program is responsible for implementing the State UST requirements for LBL. LBL will obtain a UST permit for the tank associated with the emergency generator at the replacement HWHF and comply with all applicable regulations. Underground storage tanks taken out of service as a result of the closure of the existing HWHF will be temporarily or permanently closed in accordance with applicable requirements.

Emergency Response Related to Hazardous Materials

The policy at LBL is to prevent the occurrence of hazardous material spills by facility design and preplanning. However, if a spill should occur at the HWHF or elsewhere on the LBL site, its effect on the environment would be mitigated by whatever means are available. The LBL EH&S, Protective Services, and Fire Departments are trained in emergency response techniques including techniques covering hazardous materials incidents. LBL has a Master Emergency Response Plan, individual building response plans, and a standing contractual agreement with IT Corporation (in Martinez) to respond to any hazardous material spills within two hours.

Emergency facilities and equipment maintained at LBL include: on-site fire department with two complete fire trucks and an ambulance; heavy equipment such as bulldozers, trenchers, dump trucks, fork lifts; light equipment such as shovels, picks, axes, etc.; communications equipment such as alarm systems, internal/external hand radios, and hill public address system; and decontamination equipment. The LBL Fire Department has fully encapsulating protective clothing, disposable protective suits, breathing apparatus, and other protective equipment in the event of an emergency involving hazardous materials. Sandbags, absorbent materials and pumps are available on-site for containment and cleanup of potential small spills.

Potential off-site spills would involve notification of emergency response personnel by the carrier. According to the severity of the accident, responding organizations would include the carrier, LBL EH&S Department, local fire departments, the California Highway Patrol, DOE, and IT Corporation. LBL also participates in two mutual aid agreements for fire protection and emergency response. These agreements are with the County of Alameda, the Cities of Berkeley, Oakland, and Orinda, and the East Bay Regional Parks District. The LBL and the City of Berkeley Fire Departments cooperate through planning exercises and familiarization visits.

Project Site Conditions

The location for the replacement HWHF would be north and uphill of Buildings 83 and 74 in the Life Sciences Research Area. The site is presently an undeveloped hillside. It was inspected by a risk management consultant as part of the environmental review conducted under the California Environmental Quality Act. No evidence of activities or contamination suggesting impairment of the environmental quality of the site were observed. The uphill area adjacent to the site is undeveloped woodland and it is unlikely that any contamination of the site has occurred from adjacent areas. A list of the documents prepared for Cal EPA, DOE, and the LBL EH&S and Fire Departments may be found in Appendix B of this report.

IMPACTS

This section evaluates the proposed action's potential to create a potential public health hazard; involve the use, production or disposal of materials that pose a hazard to people or animal or plant populations in the area affected; or interfere with emergency response plans or emergency evaluation plans. In making this determination, the degree of change in the type and quantity of hazardous waste handled, and the handling methods and facilities are considered.

Impact

4.10-1 **Improper handling of hazardous wastes could result in a hazard to HWHF personnel or the environment.**

The action would not increase the volume or nature of hazardous wastes handled at the LBL HWHF. Hazardous wastes would continue to be collected, and treated, prepared, packaged, and stored for transport to approved off-site disposal facilities. The replacement HWHF, like the existing facility, would not perform waste disposal, including liquid waste disposal through sanitary or storm drains.

The following would limit the potential hazard from hazardous waste handling:
An ongoing training program to instruct and update EH&S Department personnel and facility staff on the handling of hazardous materials would be continued at the new facility. Training and handling procedures would be performed in accordance with established regulations and programs as at the existing facility.

All handling activities involving transfer of hazardous wastes would continue to be conducted using fume hoods and glove boxes as required.

A comprehensive regulatory review and environmental audit routinely administered for the existing facility at LBL would be extended to include the proposed facility.

A monitoring program to sample soil and groundwater conditions would be instituted at the new facility. The monitoring program would be consistent with federal- and State-mandated environmental regulations. Sampling locations appropriate to the site would be identified when final design plans are complete.

Routine Operations

Normal handling operations at the replacement facility would pose a hazard equal to, or less than, the hazard associated with operation of the existing HWHF. Activities would continue to be conducted in a controlled manner designed to minimize the remote likelihood of an uncontrolled accidental release. The action would generally decrease the likelihood of upset conditions creating a risk to health or the environment by providing a more modern, specially designed facility for hazardous waste handling.

Proposed HWHF: Special Design Provisions

The design for the proposed HWHF is described in Chapter 2, Description of the Proposed Action. Several provisions have been included in the replacement facility design that are not part of present operating methods employed at the existing facility. These additional provisions at the proposed HWHF would further reduce the risk of accidental release of hazardous wastes.

At the proposed HWHF location, all handling of liquid hazardous wastes except loading and unloading vehicles would take place in concrete, diked and sumped containment areas, surfaced with an impervious coating and protected from rainfall. Vehicle loading and unloading would be performed in sloped concrete catch basins with valved drains.

Containment of hazardous waste would limit the extent of any potential spills and allow for immediate clean-up with sorbent materials by trained personnel. The areas used for combining solvents and oxidizers would be separated from the main the building as shown in Figure 2-3. In addition to an upgraded containment structure, the flammable liquids area would be equipped with an automatic sprinkler fire protection system.

Facility radioactive decontamination areas would include an ultrasonic cleaning area and a chemical cleaning area. All activities involving radioactive materials, except induced metals, will take place indoors. Induced metals have no potential for surface or airborne contamination and would continue to be handled outdoors.

All radioactive and hazardous waste handling areas at the HWHF would be maintained under negative pressure to protect against uncontrolled release of hazardous contaminants. Fume hood and glove box ventilation systems exhausting such contaminants would be equipped with in-line samplers for checking radioactivity in compliance with DOE regulations. The building would be designed so that the location of air emission stacks would not result in the re-entrainment of airborne contaminants.

The existing HWHF includes a 2,000 gallon waste oil storage tank. In response to stricter sampling requirements, waste oil would be stored at the replacement HWHF in 55-gallon drums in support racks in the Flammable Liquid Storage shelter. An in-rack foam fire extinguishing system would be included in Flammable Liquid Storage shelter. An emergency electrical generator would be located adjacent to the northern wall of the proposed facility. An underground diesel fuel tank would be associated with this generator.

The design of the proposed HWHF would prevent rainfall from coming into contact with hazardous wastes per applicable regulations. These measures include diked containment of all hazardous waste handling areas, and overhead rain protection to prevent filling of diked areas with rainwater. Thus all rainfall runoff from the proposed HWHF site would be free of hazardous wastes. Runoff generated by improvements at the proposed HWHF would be conveyed to Strawberry Creek through existing drainage networks, or through new drainage systems.

Impact

4.10-2 **Containment and safety features at the replacement HWHF would improve environmental and health protection over existing conditions.**

This is considered to be a beneficial impact of the proposed action.

Potential Accidents Involving Hazardous Waste

A Preliminary Safety Analysis Document (PSAD) has been prepared for the proposed HWHF which documents the potential hazards of facility operation, describes and analyzes the adequacy of measures taken to eliminate, control or mitigate identified hazards, and evaluates potential accidents and their associated risks. Several accident scenarios postulated for the HWHF by the PSAD are described below. The potential accidents considered are:

- Vehicular accident involving radioactive waste transfer to HWHF.
- Vehicular accident involving hazardous waste transfer to HWHF.
- HWHF spill involving radioactive waste.
- HWHF spill involving hazardous waste.
- Potential radioactive waste release during an earthquake.
- Potential hazardous waste release during an earthquake.

The accidents above have been selected because they represent credible scenarios for the potential release of hazardous wastes related to the action. Other potential accidents involving the facility and its activities, such as landslide, fire, underground tank leakage or intentional sabotage, may be envisioned. These accidents are not discussed here because the facility design includes provisions that would make the potential hazard from their occurrence minimal. Such design elements are discussed in Chapter 2. Other potential accident scenarios, including fire inside the HWHF, fire resulting from a vehicular accident involving hazardous waste, and release of hazardous waste to a storm drain system, are described in the PSAD. While the PSAD concludes that fire inside the HWHF could produce radiological contamination conditions which are more severe than those postulated for other radiological accidents, fire suppression equipment in the HWHF makes the occurrence of such an accident less likely than the accidents considered here. Therefore, the postulated fire accident analysis is not presented in this document.

Vehicular Accident Involving Radioactive Waste Transfer to HWHF

An accident could occur on-route to the HWHF in which radioactive waste is released, causing exposure to persons and contamination of the environment. Typically, a single shipment of waste materials on the LBL site has a total radioactivity in the tens of millicuries (mCi, or one one-thousandth of a curie) range. The majority of the individual waste packages contain less than 50 microcuries (mCi, or one one-millionth of a curie). The amount of radioactive material released by the accident would depend on the integrity of the waste containment vessel, the dispersibility of the radioactive material, and the impact energy.

Steel 17C and 17H drums and permanently mounted steel boxes are used to contain waste during on-site transfer which can withstand relatively high impact loads as required by DOT regulations. Additional packaging materials for radioactive waste are provided as described earlier in this section and provide supplemental containment. Solid dry waste is considered to be the most hazardous material in a potential accident because of its ability to become airborne. This type of waste is normally composed of paper, gloves, lab coats and small laboratory equipment which are all relatively immobile. Traffic control and topography limit vehicle speed at LBL to 25 miles per hour, and it is therefore assumed that a vehicular accident would not result in complete destruction of either the vehicle or its contents.

Total radioactivity approaching 100 mCi could be released from an assumed accident that breaches two waste packages. At the accident site, the initial puff radioactivity concentration from such an accident would be 4.8×10^{-2} mCi per cubic meter (mCi/m^3).[1] Resuspension would produce a local radioactivity concentration of 1.2×10^{-3} mCi/m^3. At a distance of 100 meters from the accident location, the air concentration of radioactive material would initially be 4.6×10^{-3} mCi/m^3 and concentration from resuspension would be 4.2×10^{-5} mCi/m^3.

Based on the above concentrations, workers involved in the accident who could be exposed to the initial puff for 30 seconds would receive an estimated 11 millirem (mrem) of radiation exposure. Personnel located 100 meters away from the accident who were exposed to the puff and resuspension for two hours would receive an estimated exposure of 2.2 mrem. These radiation exposures are comparable to occupational limits, indicating that the accident postulated would not create a significant adverse impact to human health. Surface contamination levels in the area immediately surrounding the accident release point would be below DOE Order 5480.11 release limits and would not create an adverse impact on the environment.[2]

Vehicular Accident Involving Hazardous Waste Transfer to HWHF

An on-site transportation accident that causes the release of hazardous waste is possible, subject to the same limitations regarding containment integrity, dispersibility and impact energy as discussed above for radioactive materials. A spill of solid waste is not likely to produce severe consequences; rather, a spill of either volatile organic liquid or highly corrosive acids would create the greatest impact and is discussed below.

Liquid organic chemicals transported to the HWHF would be primarily mixtures of alcohol, acetone, chlorinated cleaning solvents (trichloroethane), benzene, and heptane. Hydrochloric, nitric, chromic and sulfuric acids would also be transported on-site. For the purposes of analysis, a compound has been chosen from each group to represent a "worst-case" material. Selection is based on the toxicity and volatility of the material and the quantity handled.

In the postulated accident, it is assumed that one 55-gallon drum containing trichloroethane and two 23-gallon plastic drums of nitric acid are breached and spill their contents in an undiked area. Air concentration on top of the spill would be an estimated 5,410 milligrams per cubic meter

(mg/m^3) for the solvent and 723 mg/m^3 for nitric acid.[3] At 100 meters, the respective concentrations would be 760 mg/m^3 and 101 mg/m^3.

NIOSH publishes values for the concentrations of various chemicals at which they are Immediately Dangerous to Life or Health (IDLH). As defined by the Occupational Health and Safety Act of 1970 (30 CFR 11.3), the limit of concentration at which trichloroethane and nitric acid may result in irreversible health effects or death to healthy males exposed for 30 minutes are 5,450 and 260 mg/m^3, respectively. Comparison to the estimated concentrations resulting from the postulated accident indicates that evacuation from the immediate vicinity of the accident would be necessary, and that at a distance of 100 meters, an acceptable level of short-term exposure to each chemical would exist. The combined effect of these concentrations, obtained by adding the individual concentration/IDLH ratios, also would not surpass the acceptable limit at 100 meters.

Hazardous wastes spilled during a potential on-site transfer accident would be cleaned up by trained personnel at LBL, and contaminated materials would be handled according to all applicable requirements. Proper containment and cleanup of a potential spill would prevent any significant effect on the environment.

HWHF Spill Involving Radioactive Waste

As discussed above, an accident involving solid radioactive material would create more severe consequences than an accident with radioactive liquid because of the potential mobility of an airborne substance. In order to evaluate the impact to workers and the environment from a radioactive material accident in the HWHF, a spill of dry solid is discussed below. Although tritium is the most common radioactive substance handled in the HWHF, a tritium accident is not considered because tritium is impregnated in silica gel and packaged in tar, and would not be released in appreciable amounts during an accident.

The greatest potential for spillage of dry Low Specific Activity (LSA) waste would be during the transfer of individual waste bags from their on-site shipping drums to storage cabinets, and from storage cabinets to either glove boxes or the compactor. If mishandled, a bag could conceivably be ruptured and its contents emptied. In the accident, 50 mCi of radioactivity would be released to the inside of the compaction room in a manner similar to that described for a vehicular accident. This amount of radioactivity represents the maximum credible discharge based on HWHF standard waste packaging practices.

The resulting initial puff concentration of radioactivity would be 3.3 x 10^{-2} mCi/m^3.[4] After the initial puff, immediately over the waste spill, radioactivity would be 5.0 x 10^{-4} mCi/m^3. Assuming a 30-second exposure time in the initial puff and 10 minutes before a worker left the spill area, it is estimated that the total radiation exposure received would be 6.5 mrem. DOE Order 5480.11, which treats emergency conditions, does not set specific exposure limits during an accident. However, the exposure predicted for this scenario would be less than the annual recommended exposure limit, which is 5 rem, or 5,000 mrem.

If it is conservatively assumed that the contaminated air from the puff and immediately above the spill is exhausted undiluted, the same concentration would be released at the stack. The resulting radiation dose for an individual breathing diluted stack exhaust at 100 meters distance for two hours would be 6.9 mrem.[5] This negligible quantity for a "worst-case" outdoors exposure illustrates the extremely small dose which could be received by a person located off-site. The activity concentration outside the LBL fence line about 150 feet from the HWHF would be reduced below the already insignificant level at the stack.

<u>HWHF Spill Involving Hazardous Waste</u>

The most severe credible scenario in terms of release of hazardous waste is a forklift accident in which waste containers are breached and spill their entire contents. Two "worst-case" wastes which could be spilled are the same as discussed earlier; an organic solvent, trichloroethane, and a highly corrosive material, nitric acid. A spill of trichloroethane from a 55-gallon drum in the Chemical/Flammable Preparation Area and a spill of nitric acid from a 23-gallon barrel in the Acid Storage Room are considered.

Concentrations to which workers would be exposed from the accidents are 5,800 mg/m^3 for trichloroethane and 34,000 mg/m^3 for nitric acid.[6] As these figures are substantially greater than the IDLHs for the substances concerned (5,450 and 260 mg/m^3), immediate evacuation of either spill area would be necessary. This procedure would be included in the emergency response plan for the facility. One hundred meters downwind of the building, concentrations would be 760

mg/m^3 of solvent or 89 mg/m^3 of acid. Because the concentrations at this distance would be below the IDLHs for the chemicals of concern, impacts at and beyond 100 meters would not be considered to present an unacceptable hazard.

As discussed previously, containment features at the HWHF would prevent release of potentially spilled hazardous wastes to the environment. However, airborne contaminants resulting from a spill could create temporary effects in the immediate vicinity of the facility such as toxicity to plants or animals. The estimated concentrations of released hazardous wastes that would result during a spill at the facility would not cause a significant impact on the environment because of the short duration of release before the spill could be cleaned up, the limited area affected, and the absence of critical habitat or wildlife resources in the affected area.

Potential Radioactive Waste Release During an Earthquake

The facility would be designed to resist seismic loading. However, a seismic event conceivably could cause an accident similar to the vehicular accident described above. It would involve the breaching of waste containers and spillage of contaminated waste materials. The primary differences between the two accident scenarios would be the source term and waste volume available for release.

Radioactive contamination of solid dry waste would be the greatest potential source of radiation exposure in an earthquake due to its possible mobility. Tritium waste and other solidified products would not be expected to contribute substantial amounts of radiation release. Nearly all of the wastes (approximately 90 percent) at the HWHF would be stored in metal cabinets, 17H drums and glove boxes which provide protection from falling debris and consequently prevent exposure of the bulk of the waste present. Based on these assumptions, the quantity of radioactivity available for release in an earthquake is estimated to be 3 mCi.

The total radiation dose received by personnel in the HWHF building, assuming a 30-second exposure time in the initial puff of radioactives spilled by an earthquake and 30 minutes before a worker could be evacuated, is 331 mrem.[7] An individual 100 meters away from the building could receive 45 mrem during a two-hour exposure time. These radiation exposure are more than an order of magnitude lower than the off-site dose level for a Low Hazard Facility.[8] Resulting surface contamination would be less than 10 disintegrations per minute per square centimeter.[9]

Potential Hazardous Waste Release During an Earthquake

As mentioned earlier, the HWHF building and yards construction would be designed to resist seismic loading. Induced settling of fill material under the building cause by an earthquake would be minor and would result potentially in hairline cracking of the floor slab. The concrete slab foundation, dikes and berms provided in the HWHF would retain their structural integrity sufficiently to contain liquids spilled in an earthquake until the liquid could be recovered. Therefore, hazard from hazardous waste leakage into the ground beneath the facility and the outdoor storage areas is expected to be insignificant. Further, an earthquake would not be expected to breach underground storage tanks and cause a release of hazardous wastes to the soil or groundwater. The postulated release of chemicals due to an earthquake-induced accident is through air emission.

The bermed area in the organic solvent shed would be 500 square feet (sf) and the diked acid storage area in the HWHF would be 200 sf. Trichloroethane and nitric acid, potentially spilled through a loss of containment caused by an earthquake, are credible "worst-case" released hazardous chemicals. Assuming the wastes filled their containment areas, concentrations of 11,815 mg/m^3 and 632 mg/m^3 respectively would be reached over the spills.[10] At 100 meters from the spill, trichloroethane concentration could approach 1,660 mg/m^3 and nitric acid concentrations 88 mg/m^3. Evacuation to a distance of 100 meters would ensure that exposure would be to concentrations substantially below the IDLHs. HWHF personnel are trained to respond to emergency conditions and evacuation would avoid adverse effects to human health.

Hazardous wastes spilled during a potential HWHF accident caused by an earthquake would be contained on-site and cleaned up by trained personnel at LBL. Any airborne release of hazardous wastes to the environment would be short-term and would affect a limited area surrounding the facility.

Impact

4.10-3 Upset conditions could cause a spill or discharge of hazardous materials related to HWHF activities.

The following would limit the potential impact of upset conditions at the HWHF:
Facility design would include features to contain potential spills such as concrete diked floor areas with chemical-resistant surfaces and sloped, valved yard areas.

HEPA filters and in-line samplers would be installed to control and detect the release of unauthorized quantities of radioactive particulates.

An emergency generator would be installed at the facility to ensure safe operation in the event of a power failure.

An existing emergency communication system including the LBL Fire and EH&S Departments would be extended to new facility to allow immediate response by appropriate authorities and LBL personnel in the case of an emergency situation.

The emergency evacuation plan for the site would be circulated to LBL staff and to researchers instructing them on measures to be taken in the event of a fire, earthquake or occupational mishap.

Conclusion

Based upon hazardous waste management practices and regulations, the potential for an accidental release of wastes that could impact the environment would appear to be negligible. No new equipment or training would be needed by the LBL EH&S or Fire Departments in relation to the project; existing Mutual Aid Agreements would be adequate and would not need to be expanded. LBL would continue to provide response capability for potential hazardous waste accidents at the facility, elsewhere at LBL, or on City of Berkeley streets.

CUMULATIVE IMPACTS

The action would not add to the volume of hazardous wastes used at LBL. Potential hazard to health or the environment from LBL HWHF activities would be equal to, or lesser than, the existing hazard conditions. Therefore the action would not be considered to contribute to cumulative hazardous materials effects.

Please see Appendix C, Technical References to Endnotes, for endnotes 1-10 for Section 4.10.

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4.11 UTILITIES AND SERVICES

SETTING

This section discusses utilities and services in relation to proposed action's characteristics and needs. The various categories of utilities and services are analyzed to determine whether the action would create demand that exceeds existing capacities for the project site. Where no potential impacts have been identified, the project may be assumed to be consistent with development as discussed in the LBL LRDP (1987) and its accompanying EIR.

4.11.1 LAW ENFORCEMENT AND SECURITY

Setting

Law enforcement and security matters at LBL are handled by LBL's Protective Services Department. Protective Services is presently staffed with 16 officers. Maximum response time to the project site is less than five minutes.[1]

Impacts

This section evaluates the action's potential to exceed existing law enforcement and security services capacities. Such an exceedance would occur if the service provider anticipated great difficulty or hardship in providing increased service or the service extension resulted in major adverse secondary effects such as substantial use or reallocation of a limited resource.

The facility would be relocated to the perimeter of the LBL site and, therefore, project implementation could place some additional service demands upon the LBL Protective Services Department. Additional demands would not be substantial and would not require additional personnel or equipment to maintain existing law enforcement and security levels at LBL.[2]

Measures that would be incorporated as part of the project to maintain a high degree of security at the facility include:

- Installation of an eight-foot high chain link security fence at the perimeter of the site. A second eight-foot chain link fence would be installed immediately adjacent to the new facility providing a minimum 50-foot buffer space between the facility and the perimeter fence. New fencing would provide a continuous security boundary to the site.[3]

- Access to building and facilities within the facility area would be limited to authorized personnel. Positive identification of individuals requesting access would be provided by coded ID cards. The card key system would be operated by LBL Protective Services using a dedicated computer to identify, record and control access.[4]

4.11.2 FIRE PROTECTION

Setting

Fire protection services at LBL are provided by the LBL Fire Department, located on Cyclotron Road approximately 400 yards downhill from Building 75. The Department is staffed 24-hours with five fully-trained fire fighters and a mutual aid agreement is maintained with the City of Berkeley Fire Department. Maximum response time to the existing site is less than two minutes, and response time to the proposed site would be less than three minutes.[5] The accessibility of the existing facility is limited by low circulation space in the area and the number of building entry points.

Impacts

In this section, the action is evaluated in relation to its fire protection services requirements. The action is examined in terms of its potential to require additional service that cannot be provided without great difficulty or hardship; or major adverse secondary effects such as a substantial use or reallocation of a limited resource.

Impact

4.11-1 **Accidental fires could occur at, or around, the proposed facility.**

Development of the proposed project could place some additional service demands upon the LBL Fire Department because the facility would be close to natural vegetation set on steep slopes, and to eucalyptus plantations. However, additional demands would not be substantial in that they would not require additional personnel or equipment in order to maintain the existing level of fire protection provided at LBL.[6] The action would remove existing vegetation, including eucalyptus trees, immediately around the facility areas and therefore would decrease the risk of fire at the HWHF.

The following would limit the potential impact from fire:
The proposed action would be designed and constructed to meet all applicable fire safety codes and standards.

New landscaping would be pruned and cut back on a routine basis to prevent a build-up of vegetation at the perimeter of facility structures. The proposed access road, including adjacent gutters and sidewalks, would be 46 feet wide and would serve as a firebreak between the facility and surrounding natural vegetation.

The HWHF would be equipped with an automatic wet sprinkler system, fire alarms and smoke detection devices. The detection and alarm systems would be consistent with LBL Standard Specification 16721.[7]

Protection and detection systems would be controlled from Pyrotronics System 3 control panels. Alarms would be transmitted to the Fire Department's (Building 48) Pyrotronics Multilarm VI System by transmitter/receivers. Alarm bells and manual stations would be installed at principal exits. Automatic smoke control functions would be included in the Heating, Ventilation and Air Conditioning system and would be controlled by a separate smoke control panel with manual override controls.

Impact

4.11-2 **The action would remove dense underbrush and eucalyptus trees and would utilize fire-resistant landscaping.**

This action would reduce the danger of uncontrolled fire in the site vicinity.

4.11.3 WATER SUPPLY

Setting

LBL's primary water supply is the East Bay Municipal Utilities District (EBMUD) Shasta Reservoir (2.2 million gallons) which supplies LBL with domestic water and high-pressure water for fire fighting. A secondary water source is the EBMUD's Berkeley View Tank (approximately

1.0 million gallons). The LBL water distribution system operates entirely by gravity flow and does not require pumping.[8]

LBL has two emergency 200,000-gallon water storage tanks in separate locations for fire protection. The tanks are located near Building 75 in the Shops and Support Facilities Area and near Building 71 in the Bevalac Accelerator Complex. Diesel-powered fire pumps provide the necessary flow and pressure for maintaining a reliable fire protection system for emergencies.[9]

Impacts

This section examines potential adverse effects related to the action's capacity to substantialy deplete water supply resources, encourage activities which result in the use of large amounts of water, or use water in a wasteful manner.

The proposed utilities corridor, to be located within the new access road right-of-way, would contain the water main supplying water to the site. The main would be sized to meet domestic and fire protection needs for the area. The new water main would connect to the existing six-inch, high pressure water line that currently serves the Life Sciences Research Area and create a "loop" feed system to assure uninterrupted service. Connection to the existing line would be made about 100 feet east of the northeast corner of Building 83.[10]

No problems are anticipated in providing adequate water service to the HWHF site. Also, the facility would not be considered to use water in a wasteful manner or to encourage activities which result in the use of large amounts of water. Thus, the action would not create adverse impacts related to water supply.

4.11.4 SANITARY SEWER

Setting

The sanitary sewer system at LBL flows entirely by gravity and connects to the City of Berkeley sewer system in two locations. The west side LBL sanitary sewer system connects to the Berkeley sewer main through a monitoring station in Hearst Avenue. On the south side of LBL, a connection is made through a monitoring station located in Centennial Drive in Strawberry Canyon. LBL monitors its discharge for the presence of certain chemical and radioactive elements.[11] LBL, including the HWHF, discharges only sanitary waste into the municipal sewer;

hazardous waste is not part of LBL sanitary discharge. Sewage from LBL is treated at the EBMUD Sanitary District No. 1 plant in Oakland.

Impacts

Potential adverse effects in this section relate to the capacity of the existing sewer system to be extended to the proposed facility. The action would not increase the amount of wastewater generated by the LBL HWHF and thus would not increase the waste load applied to the sewage collection and treatment system.

The proposed utilities corridor, located within the new access road right-of-way, would contain the sewer line that provides sewerage service to the site. This line would be sized to meet sewage needs for the area. The new line would connect to the existing six-inch line to Building 83. Few facilities currently tie into the existing six-inch line and ample capacity exists to accommodate the proposed facility.[12]

4.11.5 STORM DRAINAGE

Setting

The LBL storm drainage system discharges into the Blackberry Creek watershed and the Strawberry Creek watershed. Both creeks flow through the Berkeley campus and then flow into the City of Berkeley system, continuing into San Francisco Bay.

The LBL inclusive storm sewer system provides for run-off intensities that could be experienced in a 25-year maximum design storm. The system, with large conduits, special inlet and exit structures, energy dissipators, and hardened channels, is capable of handling run-off from future building sites at LBL. In addition, the Upper Strawberry Creek, Chicken Creek, and North Fork drainage systems have been improved substantially in the past twenty years.[13]

Impacts

The proposed action would increase the storm drain runoff coefficient calculaed for approximately three acres of 500 acre watershed. This represents only a small percentage increase of downstream runoff.[14] Potential increases to downstreatm discharge are discussed in

Section 4.6, Hydrology and Water Quality. The drainage system for the proposed facility would be designed to handle a storm intensity of 2.0 inches per hour (equivalent to a 100-year storm) and would connect to the existing storm sewer system. The new system would include all necessary drain lines, manholes, catch basins, inlet structures, interceptor ditches and energy dissipators. Debris interceptor grates would be provided upstream of all inlets in unpaved areas.[15]

The existing downstream drainage facilities would not require enlargement in order to accommodate the increase in run-off resulting from the project. New upstream drainage facilities would include a storm drain in the main natural drainage channel of the new access road, with collector branches as required.[16] The new storm drainage system would be capable of handling a storm per specifications in the Storm Drainage Study, Strawberry Creek Watershed, UC LBL (Ted Kuntz, February 1980).

Where relocation of existing storm drainage facilities is required, measures would be taken to provide controlled diversion of storm water until the new lines are in place. Temporary silt traps, sedimentation ponds and/or diversion structures would be provided to minimize erosion and siltation during construction.[17]

4.11.6 ROAD MAINTENANCE

<u>Setting</u>

Although the site of the action is located in the City of Oakland, the site is immediately adjacent to the City of Berkeley and is primarily accessed from roadways in Berkeley. Funding for road maintenance in the City of Berkeley is derived from two primary sources and some secondary sources. The primary sources are monies from gas taxes distributed by the State and Alameda County Measure B (i.e., one-half percent of sales taxes). Secondary sources may include Berkeley Redevelopment Agency funds for certain improvements and special assessment district resources provided by fees imposed on district property owners. Compliance is enforced by the City Department of Public Works.

The City of Berkeley is in the process of preparing a General Plan that will include a revised transportation element. The element will contain a truck route ordinance that specifies particular City streets to be followed by truck traffic.

Impacts

During the construction phase, the proposed action would generate vehicle trips needed to carry construction personnel and materials to and from the site. The number of truck trips that would be needed for various stages of construction has been estimated as described in Section 4.8, Traffic and Circulation.

Construction vehicles trips related to the action would access the site primarily via LBL and City of Berkeley roads. Construction vehicles would travel over roads in accordance with City of Berkeley laws and ordinances. Truck weights would not exceed the maximum load limits for either the vehicle carrying capacity or the rating of the particular road used.

During a site work phase of approximately three months, the action would add about 20 truck trips per day to University Avenue's current volume of approximately 35,000 to 40,000 daily trips.[18] Travel over City of Berkeley roads by construction vehicles would not create substantial new road maintenance demands. Any contribution to the deterioration of Berkeley's roadways would be minor relative to the maintenance demands placed by existing traffic volumes.

4.11.7 EMERGENCY POWER

Setting

The emergency power generator located nearest to the site currently supplies emergency electrical power to Building 74. A 12,000-gallon capacity diesel fuel storage tank, located underground between Buildings 74 and 74B, supplies the necessary fuel to run this generator. Although this fuel tank contains sufficient capacity to power additional generators, the existing emergency power generator near Building 74 is at capacity.[19]

Impacts

An automatic starting diesel engine generator set would be installed to serve the emergency power needs of the facility. This system would include an underground fuel tank and a standby power distribution throughout the building through separate panelboards for lighting and power loads.[20]

The emergency power generator system would be installed in compliance with all applicable safety codes and regulations, including California Underground Tank Regulations. No adverse impacts related to supplying emergency power would result from the proposed action.

4.11.8 ENERGY USE

Setting

The Pacific Gas and Electric Company (PG&E) supplies both natural gas and electricity to the LBL campus. PG&E generates electrical energy from various sources including oil, natural gas, wind, cogeneration, solid waste, hydroelectric, geothermal and nuclear power.[21]

New buildings in California are required to conform to stringent energy conservation standards specified by Titles 20 and 24 of the California Code of Regulations. As a federally-operated facility, the proposed project also would be subject to DOE 6430.1A regulations regarding design specifications. These regulations require inclusion of energy conservation features in building design and allow projects to comply with via performance standards. Suggested conservation features include:

- incorporation into the building of a set of specific energy-conserving design features;
- the use of non-depletable energy resources; and
- demonstration that the building would comply with a specified "energy budget," that is, consumption of no more than a certain quantity of energy specified for different types of building uses.

Impacts

The proposed action would have an adverse effect in terms of energy use if it would: 1) encourage activities which result in the use of large amounts of fuel or energy; or 2) use fuel or energy in a wasteful manner. This section analyzes potential increase in short-term and long-term energy use at the proposed facility.

Activities planned for the replacement facility are currently occurring at the LBL HWHF. Therefore, it is not expected that there would be an increase in energy usage at LBL due to implementation of the action. The primary impact on energy resources would be the consumption of nonrenewable energy during construction and building operation.

Facility-generated motor vehicle traffic would continue to consume gasoline, oil and diesel fuel during daily activities and in the transportation of hazardous wastes to off-site disposal locations. Since the action would relocate personnel and equipment within the LBL site, there would not be an increase in oil-based energy usage.

Both natural gas and electricity would continue to be used for HWHF operation. Projected energy use for facility operation has been calculated by the LBL engineering staff. Total operational energy is estimated at approximately 868 million British thermal units (Btu) annually.[22,23] PG&E foresees no difficulty in supplying the proposed facility with sufficient natural gas and electricity.[24]

Over the HWHF's estimated 50-year life span, annualized energy usage from construction is expected to be 140 million Btu per year.[25] This represents about 14 percent of the total projected annual energy use.

No new energy use impacts would result from development of the proposed action, and no additional mitigating design features are suggested. Development of the action would comply with the standards of the DOE 6430.1A. The new building would also comply with the requirements of the Uniform Building Code regarding insulation, glazing, weather sealing, choice of building materials and water- and energy-conserving plumbing fixtures.

CUMULATIVE IMPACTS

The contribution of the proposed action to cumulative utilities and services impacts is limited by the fact that the facility would replace an existing function at LBL. Rather than introduce a new function, or add to the number of LBL employees or the volume of hazardous wastes handled, the action would relocate current employees and redirect the existing waste stream. Potential impacts on utilities and services from cumulative LBL development, including the proposed action, have been addressed in the LBL LRDP EIR (1987) and are summarized below.

The LRDP EIR indicates that cumulative development at LBL would not produce significant impacts on fire, police or other municipal services. LBL supplies its own fire and police protection and maintains its internal road system. Further, the HWHF would not contribute new demands for such services.

LBL has identified a potential cumulative impact relating to the provision of adequate sanitary sewer systems for future LBL development. The LRDP EIR recommends that any future action include an investigation of its respective contribution to capacity limitations at the time of proposal. Because the proposed action would not involve additional employees, it would not contribute to potential sanitary sewer system capacity problems at LBL.

No impacts have been identified relating to the ability of the utility companies concerned to supply energy and water to meet cumulative LBL demands. Cumulative energy and water supply impacts relate to the extension and/or relocation of water, gas and electricity lines. The LRDP EIR incorporates as a mitigation measure that such extensions be located within roadways and along rights-of-way where practical. The proposed action would be in conformance with this intention.

Cumulative development at LBL is not projected to require upgrading or enlarging existing storm drainage facilities beyond the local systems for proposed buildings, parking areas and roads. The action would include proper storm drainage facilities and therefore would not contribute to a cumulative adverse effect relating to adequate storm drainage conditions.

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[1] Officer Michael Sexton, LBL Police Department, telephone communication, April 6, 1988.

[2] Ibid.

[3] Steve Blair, Project Manager, LBL Plant Engineering Department, personal communication, December 5, 1988.

[4] LBL Plant Engineering Department, Design Program for East Canyon Corporation Yard, January 13, 1988, p.18.

[5] George Dietrich, Assistant Fire Chief, LBL Fire Department, telephone communication, April6, 1988.

[6] LBL Plant Engineering Department, op.cit., p.35.

[7] Ibid.

[8] Lawrence Berkeley Laboratory, LBL Site Development Plan, December 9, 1987, p.III-11.

[9] Ibid.

10 Bill Bennett, Plant Maintenance Technician, LBL Construction and Maintenance Department, telephone communication, April 8, 1988.

11 Lawrence Berkeley Laboratory, op.cit.

12 Bill Bennett, op.cit.

13 Lawrence Berkeley Laboratory, op.cit., p.III-12.

14 Lawrence Berkeley Laboratory, Conceptual Design Report, Hazardous Waste Handling Facility, February 1986, p. 2-2

15 LBL Plant Engineering Department, op.cit., p.17.

16 Lawrence Berkeley Laboratory, op.cit., p.2-2.

17 LBL Plant Engineering Department, Design Program for East Canyon Corporation Yard, March 24, 1988.

18 Brian Lee, Assistant City Manager of Public Works, telephone communication with EIP Associates, October 2, 1989.

19 Don Webber, Superintendent of Maintenance, LBL Construction and Maintenance Department, telephone communication, April 12, 1988.

20 LBL Plant Engineering Department, 1988, op.cit.

21 Pacific Gas and Electric, PG&E Annual Report, San Francisco, 1981.

22 The British thermal unit (Btu) is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

23 Bill Bennett, Plant Maintenance Technician, LBL Construction and Maintenance Department, telephone communication, April8, 1988.

24 Lawrence Berkeley Laboratory, 1986, op.cit., p.7-2.

25 Hannon, B. et al., "Energy and Labor in the Construction Sector," Science 202:837-847.

ADDITIONAL REFERENCE MATERIAL:

Bay Area Air Quality Management District, Air Quality and Urban Development: Guidelines for Assessing Impacts of Projects and Plans, San Francisco, November, 1985.

Rau and Wooten, Environmental Impact Analysis Handbook, McGraw Hill, 1980.

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4.12 CUMULATIVE IMPACTS

There are a number of actions planned for the Life Sciences Research Area in addition to the proposed action. These actions are listed with the proposed action in Table 4-5. Potential cumulative impacts associated with the implementation (i.e., construction and operation) of the proposed actions would relate to site layout, visual quality, vegetation and wildlife, geology, water quality, air quality, traffic and circulation, noise, and services and utilities. These cumulative impacts are discussed in the LBL LRDP EIR (1987).

Another potential cumulative impact of future actions in the Life Sciences Area would relate to anticipated increases in parking needs associated with these actions. As noted in the transportation and parking discussion, LBL's campus-wide long-range traffic management and parking system would be expected to mitigate the future parking and traffic impacts in the Life Sciences Research Area.

Proposed Action's Contribution to Cumulative Impacts

The action would relocate existing operations within the LBL site, and would not add to or reduce operations beyond LBL. The relocation of the HWHF would not change the number of personnel, vehicles, or the volume or nature of the hazardous waste handling operations. While cumulative in the Life Sciences Research Area, effects of the action would not be considered cumulative to the LBL site overall or to any larger scale environment. The action would not contribute to long-term cumulative impacts on cultural or historical resources, air quality, traffic, noise, hazardous materials, or socioeconomics at LBL. It would not create additional demand for services and utilities. The action would cause short-term cumulative construction impacts related to air quality and traffic and circulation.

The action would form part of cumulative land use changes at LBL in accordance with the LBL LRDP. The relocation of the HWHF would contribute to the efficient organization of LBL and therefore help minimize cumulative effects associated with long-range development. It would not be considered to have an adverse cumulative impact on land use or planning at the project areas, the LBL site, or larger contexts such as the University or the Cities of Berkeley and Oakland.

TABLE 4-5
FUTURE REDEVELOPMENT
LIFE SCIENCES RESEARCH AREA[1]

Category/Action	Area (gsf)	Staff (Heads)
Existing Buildings	54,200	72
Additions/Replacements		
a) Waste Handling	12,300	4
b) Cell Culture Lab. II	27,000	45
c) Life Science Additions	12,700	20
d) Human Genome Lab.	32,200	60
e) Future Building Sites	10,000	25
Subtotal	94,200	154
Planned Removals	490	0
Net Total	147,910	226

[1]Area and staffing plans are for general estimating purposes only.

Source: LBL Long Range Development Plan (August 1987).

The proposed action would contribute to cumulative visual quality impacts in the Life Sciences Research Area and the LBL site by introducing new visual elements. Visual quality impacts of the facility would be limited by its location, and by design characteristics such as vegetative screening and building style and materials.

The action would remove existing vegetation and potential habitat. In combination with other Life Sciences Research Area actions, the removal of vegetation could constitute a substantial vegetation and wildlife impact. However, the three-acre replacement facility site does not contain endangered species habitat or a wildlife migration corridor. The action also would include revegetation to mitigate impacts on vegetation and wildlife.

Construction of the replacement HWHF would involve grading the site and creating about one acre of impervious surface. Potential impacts on geology, soils and seismicity would be minimized because the action would incorporate slope stability guidelines, structural specifications, and erosion prevention techniques as recommended by the geotechnical study and by this assessment. Design would also include proper drainage facilities to avoid potential adverse hydrology impacts.

The consolidation of operational and service functions at the proposed facility would result in more efficient vehicular trips to LBL facilities. The location of the facility on a site close to the edge of LBL with direct access to existing public roads would also contribute to reducing the number of vehicles requiring access to the center of LBL. Traffic trips generated by the proposed facility would not cause a change in existing peak-hour traffic conditions on surrounding public roadways. Noise impacts generated by service delivery vehicles and transfer vehicles would result in intermittent impacts in the immediate vicinity of the proposed site. These impacts would, however, be minor.

Because the action would relocate an existing function of LBL, it would not create additional demand for fire or police services. Further, it would not add new employees and therefore would not contribute to potential sanitary sewer systems limitations identified in the LBL LRDP EIR (1987). Water and energy delivery systems would be extended to the HWHF in accordance with planned development. The action would not produce new utilities demands at LBL.

Cumulative development at LBL, including the HWHF action, is not projected to require upgrading or enlarging existing storm drainage facilities beyond the local systems for proposed buildings, parking areas and roads. Adequate storm drainage systems would be provided for future LBL actions.

Construction impacts associated with the action could cause short-term on-site inconvenience and possible impacts on building occupants in the immediate vicinity of the proposed site. Construction activity could be expected to create localized noise and the temporary disruption of service and utility lines. However, no dislocation of employees or site users is expected for the Life Sciences Research Area.

The precise extent of cumulative construction impacts associated with the issues noted above in the Life Sciences Research Area would relate to the phasing and scheduling of future development. Of the actions proposed for the area, construction would commence first on the Human Genome Laboratory. However, this construction is scheduled for the fall of 1995 and would not coincide with the replacement HWHF construction.

Future Development Context

The LBL LRDP (1987) designates LBL areas for future development. Potential additions identified for LBL are estimated to total 613,600 gross square feet (gsf). Future building removals comprise 208,800 gsf, for a net increase of 404,800 gsf on-site. This amount of space represents about 25% of the total existing LBL building area. Of the actions which have been identified for future development, the following are currently under construction: 1) Advanced Light Source (46,600 gsf), 2) Addition to Building 26 (2,000 gsf), and 3) Underground Utilities Rehabilitation. Combined, these actions account for about 48,600 gsf of building area, with no new additions to staff.

LBL occupies about 130 acres in the northern portion of the "Hill Area." It is one of seven management zones in the "Hill Area" used for planning purposes by the University of California. Future development in the "Hill Area" is discussed in the UC Berkeley Draft LRDP (1989). Projects which are proposed but not yet approved include Lawrence Hall of Science Additions (39,000 gsf), Mathematical Sciences Research Institute Addition (9,000 gsf), and Silver Laboratory Addition (25,000 gsf). The UCB LRDP (Draft, April 1989) also indicates the provision of an Environmental Health and Safety Facility (16,500 gsf) in the Hill Area, which would accommodate hazardous materials generated on the UCB Campus (UCB LRDP Appendix, Table 7). The site is as yet undetermined and it is not possible at this stage to estimate cumulative environmental impacts. The UCB facility will be the subject of a separate environmental review process. These projects together equal 73,000 gsf of potential additional "Hill Area" development.

Reserve sites for the "Hill Area" identified in the UCB Draft LRDP represent potential locations for projects envisioned beyond the 2005-2006 planning horizon. University "Hill Area" reserve sites have been designated for the following projects:

- Relocation of Field Station for Behavioral Research and Redevelopment of West Edge for Research Facilities.
- Faculty Housing
- Research Facilities
- Goat Barn Rim Research Facilities
- Poultry Husbandry Field Research

These sites are mapped in the UCB Draft LRDP (April, 1989, p. 61). Gross square footages for the projects have not been assigned.

A larger context for "Hill Area" projects is the approved and proposed development for the entire University of California at Berkeley campus. The University has approved development totaling approximately 700,000 gsf.[1] Proposed additional space involves approximately 1,786,000 gsf to 2,020,000 gsf.

In addition to the Life Sciences Research Area, LBL, "Hill Area," and University actions and projects, development in the City of Berkeley may be considered in conjunction with the proposed replacement HWHF. As cited in the UCB Draft LRDP EIR (1989), over 400,000 gsf of future development space have been proposed for private and public sector projects unrelated to the University in the City of Berkeley. The following list summarizes potential project development which could contribute cumulative impacts to the general area of the proposed action:

• UCB Category 1 (Approved Development)	772,850	GSF
• UCB 1989 LRDP Category 2 (Proposed Development)	1,874,000	GSF
• Recent Development in Downtown Berkeley (Existing Buildings Not Fully Occupied)	239,000	GSF
• Proposed Private Sector Projects	194,436	GSF
• Potential Future Private Development	55,000	GSF
• Proposed (Non-UC) Public Sector Projects	205,600	GSF
Total	3,340,886	GSF

The following is a list of additional projects not included in the table above:

- Durkee project (125,000 square feet)
- California Department of Health Services (146,000 gross square feet)

- Cutter Lab/Miles Lab (35,000 square feet plus 50,000 square feet in planning stage)
- Additional West Berkeley projects (square feet undetermined)
- Additional Telegraph Avenue area projects (square feet undetermined)
- Berkeley Waterfront Plan (530,000 square feet of hotel/mixed use)
- Albany Waterfront Plan (square feet undetermined)
- Emeryville Waterfront Plan (square feet undetermined)

These projects would add incrementally to cumulative traffic, air quality, population, housing and employment in the region. Analysis of cumulative impacts resulting from individual projects would be required at the time of project proposal. The proposed HWHF action would not increase impacts on traffic, population, housing and employment, air quality or hazardous materials generation.

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[1] University of California, Berkeley, Draft Long Range Development Plan, April 1989.

5. CONTRIBUTORS TO THE ENVIRONMENTAL ASSESSMENT

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6. REFERENCES AND ABBREVIATIONS

Previous reports reviewed in the course of this study include:

LBL East Canyon Site Utilization Study and Environmental Assessment (August, 1985).

LBL Site Development Plan Draft EIR (December, 1986).

LBL Site Development Plan Final EIR (August, 1987).

LBL Long Range Development Plan (August, 1987).

LBL Institutional Plan, FY 1991-1996 (November, 1990).

Urban design studies and reports by the Campus Planning Study Group.

Berkeley Campus Long Range Development Plan, 1990.

Campus Historical Resources Survey, Campus Planning Study Group, 1978.

Berkeley Campus Space Plan, Buildings and Campus Development Committee, 1981.

Task Force Report; Landscape, Open Space, Circulation, and Parking, prepared as part of the Berkeley Campus Space Plan, November 1982.

Task Force Report; Hill Area, prepared as part of the Berkeley Campus Space Plan, April 1984.

Amended University of California Procedures for Implementation of the California Environmental Quality Act of 1970, June 20, 1986 (effective July 1, 1986).

University of California Berkeley Long Range Development Plan Draft EIR (January 1990).

Materials identified by reference in source notes include:

Annual Environmental Monitoring Report of the Lawrence Berkeley Laboratory, 1990, UC LBL (May 1991).

Report No.2, Surface Drainage through Black Canyon Watershed at the Lawrence Radiation Laboratory, January, 1966.

Storm Drainage Study, Strawberry Creek Watershed, UC LBL, Kuntz (February, 1980).

Hazardous Waste Handling Facility Conceptual Design Report, UC LBL (February, 1986).

Design Program for the East Canyon Corporation Yard, UC LBL (March, 1988).

Geotechnical Investigation, Replacement Hazardous Waste Handling Facility, LBL, Berkeley, California, Geo/Resource Consultants, Inc.(October, 1989).

Preliminary Safety Analysis Document, Hazardous Waste Handling Facility (HWHF) at LBL, M.L. Chew & Associates, Inc.(February, 1991).

Abbreviations

A/E:	Architecture/Engineering
ARB:	State Air Resources Board
ATC:	Authority to Construct
BAAQMD:	Bay Area Air Quality Management District
Cal EPA	California Environmental Protection Agency
CCR:	California Code of Regulations
CDFG:	California Department of Fish and Game
CFR:	Code of Federal Regulations
CHP:	California Highway Patrol
Ci:	Curie - a measure of radioactivity equal to 3.7×10^{10} disintegrations per second.
CO:	Carbon Monoxide
dBA:	A-weighted decibel
DOE:	U.S.Department of Energy
DOT:	U.S.Department of Transportation
EA:	Environmental Assessment
EBMUD:	East Bay Municipal Utilities District

EH&S: Environmental Health and Safety Department

EIR: Environmental Impact Report

EPA: U.S.Environmental Protection Agency

gsf: gross square feet

HEPA: High Efficiency Particulate Air

HWCL: Hazardous Waste Control Laws

HWHF: Hazardous Waste Handling Facility

HWMP: Hazardous Waste Management Plan

IDLH: Immediately Dangerous to Life or Health

LBL: Lawrence Berkeley Laboratory

LRDP: Long Range Development Plan

LSA: Low Specific Activity

m: meters

MCE: Maximum Credible Earthquake

mCi: milliCurie

_Ci: microCurie

mg: milligrams

mrem: millirems

MSDS: Material Safety Data Sheet

msl: mean sea level

NAAQS: National Ambient Air Quality Standards

NEPA: National Environmental Policy Act

NESHAP: National Emission Standards for Hazardous Air Pollutants

NIOSH: National Institute of Occupational Safety and Health

NO_2: Nitrogen Dioxide

NO_x: Nitrogen Oxides

NRC: Nuclear Regulatory Commission

O_3: Ozone

OES: Office of Emergency Services

OSHA: Occupational Safety and Health Administration

OPR: California Office of Planning and Research

PCB: Polychlorinated Biphenyl

PG&E: Pacific Gas and Electric

PSAD: Preliminary Safety Analysis Document

PTO: Permit to Operate

RCRA: Resource Conservaton and Recovery Act

ROG: Reactive Organic Gases

Rm: Richter magnitude

RWQCB: Regional Water Quality Control Board

SAD: Safety Analysis Document

sf: square feet

SO_2: Sulfur Dioxide

TAC: Toxic Air Contaminants

TLV: Threshold Limit Value

TSCA: Toxic Substances Control Act

TSDF: Transfer, Storage, and Disposal Facility

TSP: Total Suspended Particulates

UC: University of California

USGS: United States Geological Survey

UST: Underground Storage Tank

APPENDICES

APPENDIX A

SITE GEOTECHNICAL INVESTIGATION

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GEOTECHNICAL INVESTIGATION

REPLACEMENT HAZARDOUS WASTE HANDLING FACULTY

LAWRENCE BERKELEY LABORATORY

BERKELEY, CALIFORNIA

PREPARED FOR:

LAWRENCE BERKELEY LABORATORY

ONE CYCLOTRON ROAD

BERKELEY, CALIFORNIA 94720

PREPARED BY:

GEO/RESOURCE CONSULTANTS, INC.

851 HARRISON STREET

SAN FRANCISCO, CALIFORNIA 94107

OCTOBER 17, 1989

JOB NUMBER: 1393-000

LIST OF FIGURES

LIST OF PLATES

APPENDIX

Logs of Borings, Logs of Test Pits and

Results of Laboratory Tests

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of our geological and geotechnical investigation for the proposed development of the Replacement Hazardous Waste Handling Facility for Lawrence Berkeley Laboratory. The location of the site is presented in Figure 1, Location Map. The facility will be used for processing and shipping of hazardous wastes generated at the Laboratory. The site is approximately 200 feet northwest of Building 83 as shown on Plate 1, Site Plan.

1.2 PROJECT DESCRIPTION

The proposed project includes construction of a two-story reinforced concrete and steel framed building, measuring about 170 feet by 50 feet in plan dimensions, two service yards, and a new access road. The service yards will be at two levels, elevations 875 and 890, corresponding to the floor elevations for each level of the building. Additional small structures are planned to the north side of the proposed building for storage flammable liquids.

The current plan includes a significant amount of cut to establish the roadway alignment, wall structures to retain cut areas in the upper yard, building and road alignment, and fills to bring up the proposed building and portions of the yards to planned grade. The thickness of fill will be on the order of 20 feet. The deepest cut along the roadway alignment will be approximately 20 feet. Critical cut areas will be supported by retaining walls.

1.3 SCOPE OF SERVICES

The scope of our investigation included the following:

1. A geologic evaluation, including literature review, aeri photo interpretation, site geologic mapping and ar reconnaissance to evaluate bedrock and surficial deposit faulting and seismicity and other geologic hazards on t site which may affect the proposed development.

2. Subsurface field exploration consisting of test pits a soil borings.

3. Laboratory testing and analysis of representative so samples collected during subsurface investigations.

4. Engineering analyses to develop geotechnical recommendatio for the design of the pavement section, cut slopes, fi slopes, soil bearing pressures for retaining walls, gener site grading criteria, general foundation design criteri earthwork requirements, and active and passive so pressures for wall design.

5. Preparation of this report summarizing the results of o investigations.

Maps and plans provided to us for this investigation includ Site Work and Utility Grading and Drainage Plans and Desi Development Site Plan (dated August 31, 1989) prepared by t Project Architect (Kennedy/Jenks/Chilton) showing propos improvements and University of California Topographic Quadranc Drawing No. 4B00Q131. The Site Work and Utility Grading a Drainage Plan, at a scale of 1 inch equals 40 feet was used our investigation as the base map for building and improveme locations.

During the investigation, we have provided our findings in draft report dated October 4, 1988. Current changes and a: your comments on the initial draft have been incorporated in tl draft report.

2.0 FIELD EXPLORATION AND LABORATORY TESTS

2.1 FIELD EXPLORATION

Geotechnical exploration at the proposed facility consisted of two phases:

1. Surface engineering geologic mapping;

2. Subsurface exploration with backhoe test pits and soil/rock borings and sampling.

Our engineering geologist traversed the proposed building and road locations and surrounding vicinity and performed site geologic mapping. Features mapped included contacts between major rock units, faults, landslides, and other surficial deposits. Geologic features pertaining to the site are presented on Plate 2, Geologic Map.

Test pits were excavated at the site to visually examine the depth and nature of subsurface soil and rock materials. Initially, a total of twelve test pits were excavated in August, 1988 with a rubber tire backhoe. These test pits ranged in depth from about 5 to 13 feet. A second series of nine test pits were excavated in July 1989 to supplement the initial soil information. Test pits were excavated to bedrock except in areas where the soils were too deep to be reached by the backhoe. Each test pit was logged in the field by our engineering geologist. Logs of test pits are presented in Figures A-1 through A-11 in the Appendix of this report. Test pit locations are presented on Plate 1.

A total of 8 test borings were drilled in the development area. Borings ranged in depth from about 16 to 27 feet. Each boring was drilled through the soils and into the underlying bedrock. Test borings were drilled with a track-mounted drill rig using hollow-stem augers. Samples were obtained with a Sprague and Henwood (2.5 inch I.D.) drive sampler, driven by a 140 pound hammer falling 30 inches. A detailed description of the soil and rock encountered and insitu test data from test borings are presented on the Logs of Borings, Figures A-12 through A-19, the Appendix of this report. The soils are described based the Unified Soil Classification system as shown in Figure A-20 the Appendix.

2.2 LABORATORY TESTS

The soils were re-examined in our laboratory and th classification verified. The laboratory test program inclu triaxial compression, Atterberg Limits, compaction tes moisture content and dry density determination, and R-Va resistance. The results of our laboratory tests are presented the boring logs. The results of compaction tests are presen on Figure A-21 of the Appendix. Resistance values are presen on Figures A-22 and A-23. Atterberg Limits are presented Figure A-24.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The site is located on gentle to relatively steep slop terrain, upslope from the existing Building 83. Two so draining swales pass through the site, one on the east side the site and one on the west side. The eastern swale crosses lower end of the proposed road alignment. The western sw passes along the front edge of the proposed building and thrc portions of the proposed yard. The lower portion of the west swale is deeply eroded. The banks within the eroded reach of swale are as much as 15 feet high. Loose soil and rock expc in the banks have undergone recent raveling and shallow slidi The upper portion of the western swale is considerably shallc and less eroded.

Much of the site is covered by a fairly thick stand of eucaly trees. Slopes range in steepness from gentler than 5 horizo to 1 vertical to steeper than 2 horizontal to 1 verti

Elevations in the development area range from about 830 feet to 930 feet above mean sea level.

3.2 REGIONAL GEOLOGIC SETTING

The Berkeley Hills consist of a series of northwest-trending synclines and anticlines cut by numerous faults. Rocks are primarily Jurassic-Cretaceous to Tertiary in age and are of marine, terrestrial and volcanic origin. Extensive folding and faulting by tectonic movements has taken place since the Cretaceous and was particularly intense during the Plio-Pleistocene. The project site is located on the northeast dipping limb of the Siesta Valley syncline (Radbruch, 1969). Differential erosion of soil and rock materials of varying engineering characteristics has resulted in the diverse topography in the area. Tectonic activity and the resultant crustal deformation continues in the area at the present time.

3.3 SITE GEOLOGY

Bedrock formations underlying the proposed building location and road alignment include the Orinda Formation, of Miocene-Pliocene age, and the Moraga Formation, which stratigraphically overlies the Orinda. The contact between these formations is highly irregular. There appears to be some interbedding of the rocks of the Moraga Formation with those of the Orinda Formation. At the site, the main contact between the two formations appears to cross the proposed road alignment east of the proposed building location. The building and surrounding yards will be primarily underlain by rocks of the Moraga Formation. The eastern section of the road will be underlain by the Orinda Formation. Rocks of the Orinda Formation also appear to underlie the northeast corner of the building yard.

The Moraga Formation consists of a variety of volcanic rocks including basalt and andesite flows, pyroclastic tuff beds and agglomerate. The rocks vary considerably in hardness, strength, fracturing and degree of weathering. Beneath the building location, borings and test pits generally penetrated moderately to deeply weathered, fine grained agglomerate. Some zones within this agglomerate have a somewhat sedimentary appearance resembling a clayey siltstone. The agglomerate contains angula clasts and blocks of andesite, basalt and pyroclastic debris an exhibits little to no apparent stratification. The agglomerat was probably deposited by volcanic mudflows. Some of th material may have been reworked by water after initia deposition, giving it a somewhat sedimentary appearance. Locall the agglomerate is severely weathered and decomposed to a soil like material.

Andesite flow rocks were also encountered in several borings an test pits in the building and road areas, primarily along th west and southwest sides of the rear yard and in the uppe segment of the road. The andesite tends to be harder than th agglomerate within the Moraga Formation but is closely fracture and breaks up along fractures when excavated. And site rocks a the site are generally moderately weathered, moderately hard t hard, and moderately strong to strong.

The Orinda Formation underlies the easterly portions of th proposed road. The Orinda Formation, in this area, consists c interbedded sandstone, siltstone and claystone. Rocks of th Orinda Formation tend to be weak and poorly consolidated. Th formation is well-known for forming unstable slopes in the area In the vicinity of the roadcut at the east end of the acces road, the Orinda Formation appears to consist primarily of silt sandstone and sandstone. This sandstone is moderately cementec and ranges from soft to moderately hard and weak to moderatel strong. It is slightly to moderately weathered and moderatel fractured. There have been previous landslides in the vicinit of the lower roadcut that have required repair. This indicate that slope stability will be an important consideration in desi of roadcuts in this area.

The contact between the Orinda and Moraga Formations appears strike in a roughly north-south direction where it crosses t proposed road. Review of a geotechnical investigation perform by Harding-Lawson Associates for construction of Building indicates that the contact passes beneath Building 83. addition, the contact in this area appears to be near horizontal to gently dipping. Borings at the rear of t building, as reported by Harding Lawson, penetrated a thin section of Moraga rocks overlying the Orinda Formation.

The Wildcat fault, one of the longest of the many faults in the Berkeley Hills, passes a short distance east of the development site. This fault is considered to be inactive. A detailed investigation of this fault in the vicinity of Building 74, east of the site, revealed no evidence of recent displacement. The approximate location of this fault is shown on Plate 2. In this area, the fault forms the contact between the Claremont Formation to the east and the Orinda Formation to the west. An exploratory trench excavated by Harding Lawson north of the project site indicated that the fault was nearly vertical. The Claremont Formation consists primarily of relatively well-consolidated chert, siltstone and siliceous shale. The Claremont Formation does not appear to underlie any part of the proposed development.

Rocks on the site are generally covered by variable thicknesses of colluvial and residual soils. The soils are primarily clay and gravelly clay. The area around the north end of the proposed building is underlain by a gravelly soil layer that was deposited by a debris flow. Soils extend to a depth of about 15 feet in the building vicinity. Soils along the road alignment range from as little as 1 foot thick near the western end to more than 15 feet in the vicinity of the creek crossing.

There appear to be some potentially active landslide deposits near the mouth of the eastern swale in the vicinity of the take-off of the proposed access road. In addition, there is a large repaired landslide behind Building 74 and a smaller repaired landslide behind the trailer at the northeast side of Building 83. These landslides appear to be in areas underlain by the Orinda Formation. The proposed grading for the road cut and fill, proposed wall structures and improved drainage along the roadway alignment will provide the mitigation for the hillside instability in the area.

Slopes underlain by the Moraga Formation in the western part of the site, including the vicinity of the proposed main building, do not show evidence of recent or potentially active landsliding. However, there is some minor ravelling and shallow debris sliding in the eroded banks of the western swale. Proposed grading a drainage improvement will mitigate this problem.

3.4 SUBSURFACE CONDITIONS

Subsurface conditions, as revealed in our test borings and te pits, indicate that the site is underlain by stiff to hard cl and gravelly clay. Soil thicknesses range from less than c foot to about 18 feet. The upper several feet of soil tend to expansive with high plasticity. Soils beneath this upper lay contain variable amounts of gravel and are generally classifi as CL with a few local zones of GC. Soils tend to be deepe near the two swales that pass through the site and shallower the steeper slopes. Generalized subsurface profiles a presented in Figures 2 through 8.

None of the borings or test pits encountered groundwater at t time of exploration. However, our subsurface exploration w conducted late in the summer after a two-year period in whi rainfall was below normal and groundwater levels and hillsi seepage were probably near the low end of their range fluctuation. It is probable that groundwater levels will ri during the winter months. Low areas beneath fills and deep cu may need subsurface drainage if groundwater is encountered.

3.5 SEISMICITY

The San Francisco Bay area has long been recognized as an area high seismic activity. Several major earthquakes of Richt magnitude 7.0 or greater have occurred since 1836. Two ma earthquakes occurred on the Hayward Fault within Alameda Count one in 1836 and the other in 1868. These events caused ma damage to structures and loss of lives.

The site lies about 3500 feet northeast of the active Haywa Fault, about 12 miles west of the Calaveras Fault, and about miles east of the San Andreas. The maximum credible earthqu on both of the two nearest faults, the Hayward and the Calaver could have a Richter magnitude of 7.5. The impact on the proj site of an earthquake on the nearby Hayward Fault would overshadow an event on either the San Andreas or Calaveras faults. The location of major active and other potentially active faults is shown on Figure 9.

There is a high probability that a major earthquake will occur on one or more of the active Bay Area faults during the life of the proposed structures. Hazards associated with earthquakes at the site include ground shaking and landsliding. If proper considerations are given to the design of structures and their foundations, damage due to earthquake shaking can be minimized.

Two faults, the Wildcat fault and a smaller cross fault that offsets the Wildcat, pass close to the site. Neither of these faults is considered to be active. Both the Wildcat fault and the cross fault have been mapped in detail by Harding-Lawson Associates in their report dated February 19, 1980. The cross fault is a short segment that offsets the Wildcat fault. Both of these faults are located approximately 400 feet away from the proposed structure. The Wildcat fault has been mapped within 80 feet of the proposed roadway alignment.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our investigation, we conclude that the proposed development is feasible from a geotechnical engineering standpoint, subject to our recommendations below.

The major geotechnical considerations for the proposed development include a significant amount of site grading including both cuts and fills, foundation support for the proposed building, retaining walls design and surface and subsurface drainage requirements. Our recommendations pertaining to these design considerations are presented in the following sections.

4.2 SITE GRADING CRITERIA

The site will have significant cut and fill to establish final site grades. The access road will be predominantly in c The building and side yard areas will be mostly fill ranging to a maximum of 20 feet in thickness.

4.2.1 Cut Slopes

Some of the cut slopes along the access road will be as h as 20 feet. We anticipate that the cut slopes will be bedrock of either the Orinda Formation or the Mor Formation. We recommend that the permanent cut slopes be steeper than 2 horizontal to 1 vertical (2H:1V). Any slope higher than 20 feet should be provided with intermediate bench to intercept runoff in order to minim surface erosion on the slope surface. The bench should sloped away from the embankment face and should be provi with a concrete-lined ditch to facilitate surface draina The bench should be a minimum width of 5 feet.

Temporary cut slopes during construction should be limi to not steeper than 1H:1V. Any site grading in the winter season may require flatter slopes to reduce amount of sloughing and erosion problems.

4.2.2 Fill Placement

In areas to receive fill, the site should be stripped vegetation and organic material. The surface should scarified, moisture-conditioned and compacted to a mini of 95 percent of maximum dry density (ASTM D1557-78(C)). any soft spot is detected in the exposed subgrade, it sho be overexcavated and recompacted. Fill slopes, if requi should be no steeper than 1-1/2 H:1V.

On-site soil and rock used as engineered fill can be usec a selective basis. The surface soil is relatively expans and should be blended with other on-site non-expans material, and the blended soils should be utilized in lower fill. Alternatively, blended soil could be used the landscaped areas. The upper 3 feet of fill, incluc the outer 3 feet of exposed fill slopes, should consist of non-expansive material. Fill should be placed in lifts of no more than 8 inches in loose thickness, moisture conditioned and compacted to a minimum of 95 percent of maximum dry density. Fill should be placed by benching and keying into the natural soil/rock in horizontal lifts. If rock fragments from the cut are used as fill, they should be broken down to less than 4 inches in their greatest dimension. Import fill, if required, should consist of inorganic granular soils of not more than 4 inches in greatest dimension, and should consist of non-expansive soils (Liquid Limit less than 30 and Plasticity Index of less than 12). All import fill should be approved by us prior to use.

4.2.3 Subsurface Drainage

Fill over 10 feet in thickness should have subsurface drainage. The drain should consist of a minimum of 4-inch-diameter PVC pipe embedded in Class II permeable drain rock. We recommend that a subdrain system be installed in the fill supporting the building pad. The proposed construction has fill over two natural swales where hillside drainage is established. We recommend that a culvert be installed in the larger swale and a subdrain be installed in the smaller swale to facilitate continuous drainage after site development. The proposed locations of the recommended culverts and subdrain are presented in Plate 1.

4.2.4 Surface Drainage and Erosion Control

Surface drainage should be directed away from the foundations and toward the roadway or to approved drainage structures. Ponding of water adjacent to foundations or slopes should be avoided. Planters and landscaped areas adjacent to building perimeters should be designed to minimize infiltration into the foundation soils. Graded areas should be planted as soon as practical after construction to reduce the erosion potential of the exposed soils. Surface water run-off at the top of cut and fill slopes should be channeled into drainage ditches to prevent ponding and erosion of the slope face. Geotextile fab: may also be considered to cover cut and fill slopes : added stability and erosion control.

4.3 BUILDING FOUNDATION SUPPORT

The buildings will be located predominantly in the fill, but : possibly extend into some minor cut areas. One of the ma: considerations for the building foundation is the presence different thicknesses of fill over various thickness of nat: soil. Shallow foundations supported on fill could suffer f: differential settlement resulting from loads imposed by the : fill and the proposed building. In addition, shallow foundati‹ may be less adequate under seismic loads. On this basis, recommend that buildings and the flammable liquid stor: structure should be supported by drilled, cast-in-place, concr‹ piers gaining frictional support in soil and bedrock.

We recommend that drilled piers should be a minimum of 18 incl in diameter and that they should bottom at least 5 feet i: competent bedrock. The piers should be designed as follows:

	Side Friction Resistance	
	Soil (psf)	Rock (psf)
Dead Load	1000	2000
Dead & Reduced Live	1250	2500
Total	1500	3000
Uplift	800	1200

Piers should be spaced a minimum of 3 diameters apart. Based the test boring and test pit information, we anticipate that depth of drilled piers will range from 15 to 30 feet from proposed finished building grade of Elevation 875 feet. anticipate that the soil encountered in the drilled pier will relatively stiff and casing may not be needed. However s localized sloughing may be encountered in some pier holes casing should be installed under these conditions. groundwater was encountered in any of the borings at the time our exploration, and significant dewatering in the pier holes not anticipated. However, there may be hillside seepage into the pier holes during the wet season. If water is encountered in the drilled holes, the holes should be pumped dry prior to pouring concrete or, alternatively, 1 to 2 sacks of cement should be added to the bottom of the pier holes.

4.4 LATERAL RESISTANCE

Lateral resistance can be obtained by passive soil pressure acting on the grade beam and pier cap and also acting on the upper 5 feet of the pier. We recommend that a passive soil pressure of 300 pounds per cubic foot be used (equivalent fluid pressure). The soil pressure acting on the top of the pier should be considered to act in an area of 2 times the diameter. When considering seismic load in the design, a passive soil pressure of 400 pcf can be used.

4.5 RETAINING WALLS

We understand that most of the major cut slopes will be supported by retaining walls. Based on the design information available to us, we anticipate that concrete crib walls will be used to retain cut slopes that will be up to 30 feet high. In high cut slope areas, a series of staggered crib walls would be required.

We recommend that the crib walls be backfilled with either on-site soil compacted to 85% compaction or with on-site rock fragments generated from the cut. Temporary cut slopes should be limited to no steeper than 1H:1V during construction. If any steeper slope is required, our engineer and geologist should be present to evaluate the slope material and its stability. A temporary shoring system may be required to maintain slope stability during wall installation. Alternatively, the slope excavation could be performed in stages, if feasible.

We recommend that wall backdrains be provided to relieve hydrostatic pressure against the wall. Backdrains should consist of 4-inch-diameter PVC pipe embedded in a minimum of 1 foot of drain rock. Water collected by the backdrain should be directed to an appropriate outlet such as a culvert, ditch or gutter.

Crib walls should be battered to enhance stability. A mini battered wall angle of 2 inches per foot is recommended. wall should be embedded a minimum of 2 feet into native firm s or rock. The retaining wall should be designed for lateral s pressures shown in Figure 10. Allowable bearing pressure for proposed walls should be limited to 5000 psf for walls botto into bedrock and 2500 psf for walls bottomed in native so These bearing pressures can be increased to 3,500 psf and 7, psf for soil and rock, respectively, when considering transi seismic load in the design. For lateral resistance, a pass pressure of 1000 psf uniform pressure distribution can be us If the upper 1 foot of soil is disturbed, it should be neglec for lateral resistance. A coefficient of friction of 0.35 can used for frictional resistance between the base of walls supporting soil or rock. The coefficient of friction can increased to 0.4 for considering seismic load.

4.6 PRELIMINARY FLEXIBLE PAVEMENT THICKNESS

Based on soil classification and laboratory tests, we estim that the R-value of on-site soils to be generally on the order 13 or more. Based on assumed traffic index values as indicat our preliminary recommended pavement sections are presented the table below:

ASPHALT PAVEMENT SECTION

Assumed Traffic Index	Asphalt Concrete Thickness (inches)	Aggregate Base Course Thickness (inches)		Aggregate Subbase Thickness (inches)
4	2.0	7.5		0.0
5	2.5	9.0		0.0
6	3.0	12.0	or	0.0
		6.0	plus	7.0
7	3.5	14.5	or	0.0
		7.0	plus	8.0
8	4.5	16.0	or	0.0
		8.0	plus	9.0

The soil/rock conditions at the anticipated finished subgrade elevations were somewhat variable across the site. Pavement sections should be re-evaluated based on the actual subgrade conditions after site grading and utility construction are completed. We recommend that laboratory testing of the material exposed in the subgrades be performed and pavement section designs be verified. If necessary, further design should be undertaken based on the test results. Aggregate base and subbase should conform to Caltrans Standard Specification. The upper six inches of subgrade should be moisture conditioned and compacted to a minimum of 95 percent of maximum dry density in accordance with ASTM D1557-78 (c) method. Subgrade in cuts should be proof-rolled. Our pavement evaluation was based on assumed traffic indices and the physical properties of representative soils which are likely to be exposed at proposed roadway subgrade elevations. These recommendations should be reviewed if import soils are placed in pavement areas or if site conditions during construction appear to be different from those indicated by our borings and test pits.

4.7 SLAB-ON-GRADE FLOORS

The upper one foot of subgrade beneath slab-on-grade floors should be compacted to at least 95 percent relative compaction. The finished subgrade surface should be smooth and non-yielding.

A capillary moisture break and vapor barrier should be provided in any areas where moisture penetration through the floor slabs would be undesirable. Capillary moisture barriers normally consist of at least 4 inches of clean, 3/4-inch crushed rock or gravel over subgrade, a vapor barrier membrane (such as a 6-mil polyethlene sheet) over the crushed rock, and about two inches of sand over the membrane as protection against puncturing the vapor barrier during construction.

4.8 CONSTRUCTION CONSIDERATIONS

Much of the major cut area is expected to expose rock of either the Orinda and Moraga Formations. We believe that both types of rock are generally rippable with standard excavation equipment

6.0 REFERENCES

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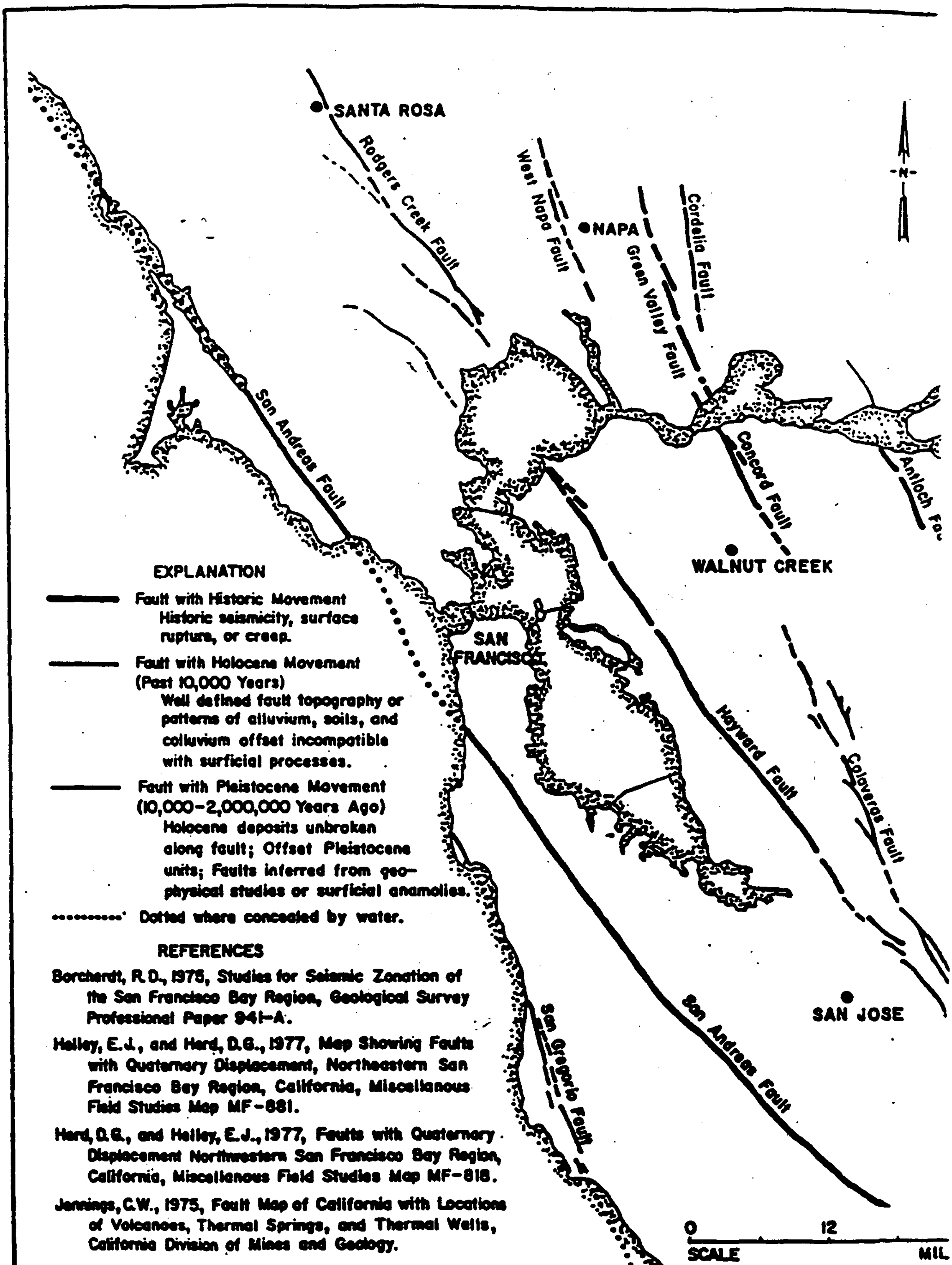
FORM 3-16(84)



EXPLANATION

Fault with Historic Movement
Historic seismicity, surface rupture, or creep.

Fault with Holocene Movement (Past 10,000 Years)
Well defined fault topography or patterns of alluvium, soils, and colluvium offset incompatible with surficial processes.

Fault with Pleistocene Movement (10,000–2,000,000 Years Ago)
Holocene deposits unbroken along fault; Offset Pleistocene units; Faults inferred from geophysical studies or surficial anamolies.

Dotted where concealed by water.

REFERENCES

Borcherdt, R.D., 1975, Studies for Seismic Zonation of the San Francisco Bay Region, Geological Survey Professional Paper 941-A.

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Herd, D.G., and Helley, E.J., 1977, Faults with Quaternary Displacement Northwestern San Francisco Bay Region, California, Miscellanous Field Studies Map MF-818.

Jennings, C.W., 1975, Fault Map of California with Locations of Volcanoes, Thermal Springs, and Thermal Wells, California Division of Mines and Geology.

Geo/Resource Consultants, Inc.
CONSULTING GEOLOGISTS / ENGINEERS / GEOPHYSICISTS

Job no. 1393-00 Appr. ____ Date 10/16/89

Major Historic–Active Faults and Potential–Active Faults in the San Francisco Bay Area

APPENDIX B

REVIEW OF RECORDS AND DOCUMENTS

- Regulatory Agency Review
- LBL Document Review

APPENDIX B

REVIEW OF RECORDS AND DOCUMENTS

REGULATORY AGENCY FILES REVIEW

Public record files at the RWQCB were reviewed for any reported releases of petroleum products or other chemical substances that have occurred within the LBL complex. Three reports were found to contain information on tanks within the LBL complex. At Building 69, the shipping and receiving facility located adjacent to Building 75, a waste oil tank was removed and replaced with a 2,000-gallon capacity tank approximately two years ago. The engineer responsible for tank removal noted that there was no obvious soil contamination associated with this tank. Soil analysis for oils and grease according to EPA Method 418.1 indicated that oils and grease were present at a concentration of 7.1 mg/Kg (ppm). This level is well below the 100 ppm policy limit set by the RWQCB for soils in the San Francisco Bay Area.

A 600-gallon diesel tank was removed from a location adjacent to Building B62, MMRD, which borders the the proposed HWHF site. However, this site is located downhill from the new location, and is, therefore, down-gradient with respect to groundwater flow. The tank removal report stated that soil located beneath the underground storage tank contained diesel fuel at a concentration of 32 ppm. This concentration is below the regulatory policy limit of 100 ppm.

A leak in piping associated with a diesel tank located at Building B74, Biomed, was also reported in the RWQCB files. A release of diesel fuel to the soil resulted from the piping leak. Soil excavated from this location was reported to contain 32 ppm of diesel fuel. It was unknown if groundwater was affected by the release. Groundwater in the vicinity of Building B74 is approximately 50 feet below grade, according to engineers who reported on the soil excavation. Building B74 is located across Centennial Drive and downhill from the site of the proposed HWHF.

LBL DOCUMENTS REVIEW

Much of the above information was elicited from a review of regulatory ag documents located in the LBL EH&S Department. The documents reviewed included:

- "RCRA Compliance Evaluation," EPA, June 1987.
- "Environmental Surveillance Program of LBL," April 1976, by Tech. Serv. Div., LE
- "Annual Environmental Monitoring Report of LBL for 1986," April 1987, by Engineering Division for US Dept. of Energy.
- "California Department of Health Services Checklist of Regulatory Compliar report of LBL compliance with RCRA signed by Dwight Hoenig, Chief of DHS.
- "Quarterly Inspection of PCB Transformers."
- "Drum Accumulation Checklist for Buildings at LBL."
- "LBL Waste Management Plan, 5480.2, Mixed Radioactive Waste, and 58 Radioactive", by LBL Env. Health and Safety for DOE, October 1987.
- "Hazardous Waste Permit," (RCRA Part B), EPA.

The above-listed documents demonstrate the environmental audits and hazardous radioactive materials handling inspections are routinely performed by the DHS, on be of the EPA, by the DOE, and by LBL EH&S Department personnel. In addition, the Fire Department routinely inspects the entire LBL complex for compliance with Uniform Fire Code (1985). In the event of a spill of a hazardous substance, Environme Health and Safety personnel, who have received considerable training in the rou handling of hazardous materials and the response to hazardous materials incidents, dispatched to the scene of such spills for clean-up.

APPENDIX C

TECHNICAL REFERENCES TO ENDNOTES

APPENDIX C

TECHNICAL REFERENCES TO ENDNOTES

Section 4.7 References

Footnote 3

The concentration of radioactivity in the effluent at the point of release is estimated using the following equation.

$C(\mu Ci/cc) = 0.0353 \times f \times (A \times R_f)/Q_v$

where A = Radioactivity available for release (mCi)

R_f = Fractional release rate (min^{-1})

Q_v = Ventilation Zone flow rate through the stack (cfm)

f = Filter removal fraction

The following table presents the assumed release fractions, ventilation flow rates for the various ventilation zones in which the operations will be performed and the radioactive contaminant concentrations discharged. It should be noted that the stack air flow rate for solidification is based on solidification processes performed in the glove boxes (ventilation zone 2).

Waste Procedure	A(mCi)	Release Rate	HEPA	Stack Air Flow (cfm)	Concentration (μCi/cc)
Compaction	0.1†	6.1×10^{-3}*	3×10^{-4}	20,000	3.2×10^{-13}
Solidification	0.06††	6.1×10^{-6}**	1×10^{-2}****	7,000	1.9×10^{-14}
Decontamination	0.06††	6.1×10^{-4}***	3×10^{-4}	7,000	5.5×10^{-14}

*Fractional release rate (min^{-1}) = Resuspension factor(m^{-1})xQ_v(cfm)/A(ft^2) x 0.305(m/ft). Resuspension factor = $10^{-4}m^{-1}$, considering compaction motion.

**Release from liquid is estimated by using resuspension factor and reducing by a factor of 1000.

***Resuspension factor (m^{-1}) = 10^{-5}.

****Assume 99.0% filtration efficiency for fine vapor.

†Based on 2 bags breached during compaction operation.

††Based on amount processed in 60 minutes.

Footnote 4

HWHF NORMAL OPERATION RADIOACTIVE EFFLUENTS

Isotopes	Discharged Concentrations (uCi/cc)	DOE5400.xx DCG's Release Limits
^{14}C	1.6×10^{-14}	6×10^{-9}
^{85}Sr	1.1×10^{-13}	1×10^{-6}
^{99m}Tc	8.8×10^{-14}	1×10^{-7}
^{106}Cd	2.4×10^{-14}	3×10^{-9}
^{118}Te	3.2×10^{-14}	1×10^{-9}
^{123}I	8.8×10^{-15}	4×10^{-8}
^{125}I	1.9×10^{-14}	5×10^{-10}
^{131}I	4.0×10^{-15}	4×10^{-10}
^{204}Tl	1.6×10^{-15}	5×10^{-9}
^{228}Th	6.1×10^{-16}	4×10^{-14}
^{232}Th	8.8×10^{-16}	7×10^{-15}
^{237}Np	6.1×10^{-16}	2×10^{-14}
^{238}Pu	2.6×10^{-16}	3×10^{-14}
^{239}Pu	1.0×10^{-15}	2×10^{-14}
^{242}Pu	3.2×10^{-16}	2×10^{-14}
^{241}Am	3.2×10^{-16}	2×10^{-14}
^{243}Am	6.1×10^{-15}	3×10^{-14}
^{248}Cm	1.6×10^{-16}	6×10^{-15}
^{249}Cf	8.8×10^{-16}	2×10^{-14}

*With the cancellation of 5480.1A, DOE-EH has directed its contractors to use Draft DC Order 5400.xx as interim guidance until an order is finalized. A person breathing a contaminated to the DCG for one year would receive 100 mrem committed effecti dose equivalent.

Footnote 6

$$QR\ (lb/min) = LFA \times Surface\ Area\ (ft^2) \times 2.8$$

Using Trichloroethane and Nitric Acid to represent each type of material and an expos surface area equivalent to a cylinder having a 1/2 inch diameter and 12 inch length, th evaporation rates would be:

QR (Trichloroethane) = 2.1×10^{-3} lb/min

QR (Nitric Acid) = 2.4×10^{-4} lb/min

The ventilation exhaust flow rate for the Chemical/Flammable Preparation Room will be approximately 10,000 cfm. The concentrations in the effluent will be:

$C\,(mg/m^3) = 1.6 \times 10^7\,(QR/Qa)$

C (Trichloroethane) = $3.4\ mg/m^3$

C (Nitric Acid) = $0.4\ mg/m^3$

Section 4.10 References

Footnote 1

At the accident site, a release fraction of 10^{-4} is applied to the waste material in the drum to determine the inital puff concentration. The instantaneous release concentration is: $100\ \mu Ci \times 10^{-4} / 0.208\ m^3 = 4.8 \times 10\text{-}2\ \mu Ci/m^3$

The resuspension rate of particulates is in the range of 10^{-3} to $2 \times 10^{-11}\ m^{-1}$ for outdoor measurements (ref 1). A resuspension factor $K = 10^{-5}\ m^{-1}$ is used for this analysis. The assumed resuspension factor is conservative because of the roughness of the contaminated surfaces. The fractional release rate (F) from the spilled waste is K x u, u = wind speed (m/sec). The airborne concentration of radioactivity in the immediate accident site (i.e., on top of the wastes) is estimated by the volume of air that flows (V) through on top of the waste. Due to the extremely low volatility of the contamination, V is assumed to have a flow cross-section of 3'x3'. The windspeed v is assumed to be 1.5 m/sec.

Local radioactivity concentration from resuspension:

$$C(\mu Ci/m^3) = 100\ \mu Ci \times F\ (sec^{-1})/V\ (m^3/sec)$$
$$= 100 \times 1.5 \times 10^{-5}/1.25$$
$$= 1.2 \times 10^{-3}\ \mu Ci/m^3$$

At a distance of 100m away from the accident location, the air concentration of radioactive material from the puff release is calculated as follows:

$X = 2Q/(2\pi)^{2/3}\ \sigma_x\ \sigma_y\ \sigma_z$ (ref. 2)

$\sigma_{x,y} = \sigma_x = \sigma_y = 1.3m$ for Type F stability

$\sigma_z = 0.75m$ for Type F stability

Q = Initial activity released μCi

x = down wind distance from center of puff

Concentration (X) = 4.6×10^{-3} μci/m^3 at center of the cloud

The concentration from the resuspension of the radioactivity from the waste at 1 m is:

Concentration = 100 μCi x F x (X/Q)

Release rate F = resuspension factor K (m^{-1}) x wind speed u (m/sec)

$F = 10^{-5}\ m^{-1} \times 1.5\ m/sec = 1.5 \times 10^{-5}\ sec^{-1}$

$(X/Q) = (\pi\ u\ s_y\ s_z)^{-1} = 0.028$, F stability class

Concentration (resuspension, 100m) = 4.2×10^{-5} μCi/m^3

Footnote 2

The area immediately surrounding the accident release point may become contaminat from the activity in the plume. At the plume maximum, from a puff release (the wor case), the air concentration was estimated as 4.8×10^{-2} μCi/m^3 or 4.8×10^{-2} μCi/m^3 2.22×10^6 dpm/μCi≈100,000 dpm/m^3.

If the activity from $1m^3$ is assumed to settle over an area of $1m^2$, the surfac contamination levels would be:

$$100{,}000\ dpm/m^2 \times \frac{10^{-4}m^2}{cm^2} = \frac{10\ dpm}{cm^2} = \frac{1{,}000\ dpm}{100\ cm^2}$$

which is below the release limits specified in DOE Order 5840.11.

Footnote 3

For the same scenario (i.e., transport container type, transporter construction, acce road terrain, and speed limit) given in the A1R accident, it is assumed that one 55-gallo drum containing the organic solvent and two 23-gallon plastic drums are breached ar spill their contents. The release rates for the chemicals are calculated using the equatic for a liquid spilled in an undiked area:

QR (lbs/min) = QS (lbs) x LFA x 1.4

for wind speed of 1.5 m/sec.

Where:
QR = Rate of Release to air (lbs/min)
QS = Mass spilled (lbs.)
LFA = $(0.106 \times MW^{2/3} \times 0.49 \times VP) / (82.05 \times (T1 + 273))$
MW = Molecular Weight (g)
VP = Vapor Pressure (mm Hg)
T1 = Temperature (degree C)

The rate of release to air (QR) for the organic solvent and acid are:

	QS (lbs)	LFA	QR (lbs/min)
Trichloroethane	459	5.60×10^3	3.59
Nitric Acid	506	6.80×10^{-4}	0.48

The near field concentration (<100m) and the far field concentation are estimated by the following:

Near-Field Air Concentrations

Air concentration on top of the spill is derived assuming an effective air flow cross-section over the spill area of 6 feet wide by 6 feet high, with a wind speed of 1.5 m/sec, the volume of air flow (Q_a) on top of the spill is $301 m^3/min$. The concentrations are then QR/Q_a. Concentrations at various distances out to 100m is extrapolated linearly.

	Top of Spill	20 m	50 m	80 m	IDLH
C (Trichloroethane) mg/m^3	5,410	4,400	3,000	1,600	5,450
C (Nitric Acid) mg/m^3	723	600	400	230	260

Far-Field Air Concentrations

$C (mg/m^3) = (7.56 \times 10^3) \times QR \times (X/Q)$
where $(X/Q) = (\pi\ \mu\ \sigma_y\ \sigma_z)^{-1}$

	100m	500m	1,000m	IDLH
(X/Q) =	0.028	0.003	0.0014	
C (Trichloroethane) mg/m^3 =	760	82.0	37.5	5,450
C (Nitric Acid) mg/m^3 =	101	10.9	5.1	260

The acceptable combined effects of the two materials is $C_T/(IDLH)_T + C_N/(IDLH)_N \leq 1$.

For a distance of 100m the combined effect compared with the IDLHs is 0.53 which is less than 1.

Footnote 4

The fraction of the radioactive material is the waste that is released to the air from the bag is 10^{-4}. The initial puff concentration that is released into the room from the bag, considering 1/2 the volume of a 60-gallon bag is:

$$(50\ \mu Ci \times 10^{-4})/0.15m^3 = 3.3 \times 10^{-2}\ \mu Ci/m^3$$

Assuming the air flow is slow in the room, the radioactivity concentration immediately above the wastes is:

$$C\ (\mu Ci/m^3) = (50\ \mu Ci/\text{Area of spillage}) \times \text{Resuspension Factor}$$

Assuming the waste is spread over an area of $2m^2$,

$$C = (50\mu Ci/1m^2) \times 10^{-5}\ m^{-1} = 5 \times 10^{-4}\ \mu Ci/m^3$$

The total radiation exposure received by personnel involved in the building assuming a 30 second exposure time in the initial puff and 10 minutes before the individuals leave the area is 6.5 mrem.

Footnote 5

$$\text{Concentration (Puff, 100m)} = 1.15 \times 10^{-3}\ \mu Ci/m^3$$

And the concentration at the stack from resuspension is:

$$C\ (\text{Resuspension, 100m}) = 1.9 \times 10^{-4}\ \mu Ci/m^3$$

The radiation does for an individual breathing diluted air 100 meters downwind of the stack for two hours would be 6.9 mrem.

Footnote 6

The surface areas of the Chemical/Flammable Preparation area and the Acid Storage Room are about 1,000 and 200 square feet respectively. The conservative evaporation rate (assuming ventilation air velocity is 1.5 m/sec) is:

QR (lbs/min) = LFA x surface area x 2.8

QR (Trichloroethane) = 3.59 lbs/min.*

QR (Nitric Acid) = 0.42 lbs/min.

*Spilled quantity is insufficient to fill up room area. The release rate reflects an undiked release.

The concentration to which the worker is exposed can be estimated by dividing the QR by the room ventilation rate:

$$C\ (\text{Trichloroethane, stack}) = 2.59\ \text{lbs/min.} / 10{,}000\ \text{ft}^3/\text{min}) \times 1.62 \times 10^7 = 5{,}800\ \text{mg/m}^3$$

$$C\ (\text{Nitric Acid, stack}) = (0.42/200) \times 1.62 \times 10^7 = 34{,}000\ \text{mg/m}^3$$

The worker would be exposed to greater than orders of magnitude of the IDLH and would have to evacuate the spill area immediately.

The concentration downwind of the building from the above postulated spill can be esimated by the following equations from section A1H:

$$C\ (\text{mg/m}^3) = (7.56 \times 10^3) \times QR \times (X/Q)$$

Where:

$$(X/Q) = (\pi\ \mu\ \sigma_y\ \sigma_z)^{-1}$$

		100m	500m	1,000m	IDLH
(X/Q)	=	0.028	0.003	0.0014	
C (Trichloroethane) mg/m^3	=	760	82.0	37.5	5,450
C (Nitric Acid) mg/m^3	=	89	9.5	4.4	260

Footnote 7 (Accident C1R)

The quantity of the radioactivity for release is estimated to be 3mCi. The factic the radioactive material in the waste that is released is 10^{-4}. The initial concentration considering 15-drum volume is released:

$$(3\text{mCi} \times 10^{-4})/3.12\ \text{m}^3 = 9.6 \times 10^{-5}\ \text{mCi/m}^3$$

Assuming the effective volumetric flow of air on top of the waste is identic accident A1R, the radioactivity concentration immediately above the wastes is:

$$(3\text{mCi} \times 1.5 \times 10^{-5}\ \text{sec}^{-1})/1.25\ \text{m}^3/\text{sec} = 3.6 \times 10^{5}\ \text{mCi/m}^3$$

Puff concentration at a distance of 100m away from the building is 3.6 x mCi/m^3 (at center of the cloud) and from the resuspension of the radioactivity i x 10^{-6} mCi/m^3.

The total radiation exposure received by personnel involved in the building assum: 30-second exposure time in the initial puff and 30 minutes before the individual be evacuated is 331 mrem. An individual 100 meters away from the building potentially receive 45 mrem during a two-hour exposure time.

Footnote 8

San Francisco Operations Office, Management Directive 5480.5, June 15, 1987.

Footnote 9 (Accident C1R)

Surface contamination from deposition from the initial puff release will deposit than 10 dpm/100cm^2. This value was estimated using the same method as the on- transportation accident.

Footnote 10 (Accident B1H)

In accordance with the equation below, the rates of release are:

QR (lbs/min) = LRA x Diked Area (ft^2) x 2.8

QR (Trichloroethane) = 7.84 lbs/min.

QR (Nitric Acid) = 0.42 lbs/min

Applying the same assumptions and calculations as those for accident A1H, the concentrations at varoius distances from the facility is shown below:

Near-Field Concentration

		Top of Spill	20m	50m	80m	IDLH
C (Trichloroethane) mg/m^3	=	11,815	9,610	6,552	3,500	5,450
C (Nitric Acid) mg/m^3	=	632	525	350	201	260

Far-Field Concentration

		100m	500m	1,000m	IDLH
(X/Q)	=	0.028	0.003	0.0014	
C (Trichloroethane) mg/m^3	=	1,660	179	82	5,450
C (Nitric Acid) mg/m^3	=	88.4	9.5	4.5	260

REFERENCES

1. E. Walker, "A Summary of Parameters Affecting the Release and Transport of Radioactive Material from an Unplanned Incident," Sept. 1978.

2. D. Bruce Turner, "Workbook of Atmospheric Dispersion Estimates," U.S. Department of Health, Education and Welfare, 1969.

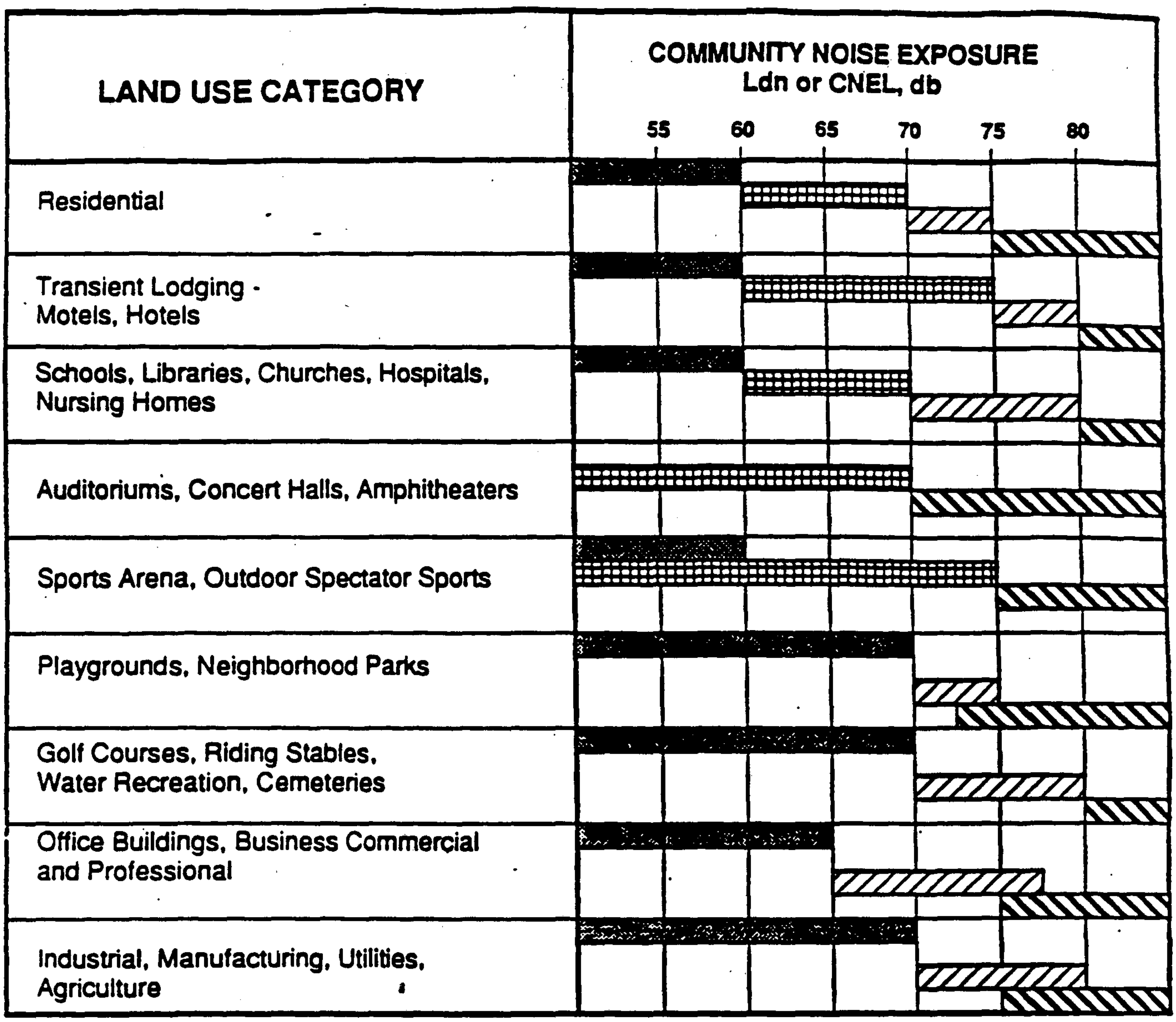
APPENDIX D
ACOUSTIC FUNDAMENTALS

APPENDIX D

ACOUSTIC FUNDAMENTALS

Sound is a mechanical form of radiant energy which is transmitted by pressure waves in the air. It is characterized by two parameters: amplitude and frequency. Amplitude is the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic rather than a linear scale. As a consequence, the pressure difference in a 10 dB sound is 10 times that of a 0 dB sound, a 20 dB sound is 100 times the pressure difference, 30 db sound is 1,000 times, and so on. Another feature of the decibel scale is the way in which sound amplitudes from multiple sources add. A 65 dB point source of sound, say a truck, when joined by another similar source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish 2 dB change in amplitude as the minimum audible difference for the average person.

Frequency is the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (abbreviated Hz; one Hz equals one cycle per second). The human ear is not equally sensitive to sound of different frequencies. Sound waves below 16 Hz or above 20,000 Hz cannot be heard at all and the ear is more sensitive to sound in the higher portion of this range than in the lower. To approximate this sensitivity, environmental sound is usually measured in A-weighted decibels (dBA). On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA.



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

NORMALLY UNACCEPTABLE
New construction of development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development clearly should not be undertaken.

Source: Noise element of the San Ramon General Plan

APPENDIX E

BIOLOGICAL ASSESSMENT RESULTS

AND

UNITED STATES FISH AND WILDLIFE SERVICE LETTER

United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
Sacramento Field Office
2800 Cottage Way, Room E-1823
Sacramento, California 95825-1846

In Reply Refer To:
1-1-91-I-693

July 31, 1991

Mr. James K. Hartman
Department of Energy
San Francisco Operations Office
Attention: Mary Gross
1333 Broadway
Oakland, California 94612

Subject: Replacement Hazardous Handling Facility, Lawrence Berkeley Laboratory, Alameda County, California and the Threatened Bay Checkerspot Butterfly

Dear Mr. Hartman:

This responds to your letter, dated June 13, 1991, requesting concurrence with your determination that the proposed action would not adversely affect the federally listed bay checkerspot butterfly (*Euphyrdryas editha bayensis*) at the Replacement Hazardous Handling Facility site. We concur with your determination based on a review of the letter, a letter from Mr. John Garcia to your office dated May 23, 1991, and a telephone conversation between Mary Gross of your office and Chris Nagano of my staff on July 23, 1991. Therefore, no further action pursuant to Endangered Species Act of 1973, as amended, is necessary unless new information reveals effects of the action that may affect listed species or critical habitat in a manner that was not considered in your determination, and/or if a new species is listed or critical habitat is designated that may be affected by the action.

Please contact Chris Nagano at 916/978-4866 if you have any questions. Thank you for your interest in endangered species.

Sincerely,

Wayne S. White
Field Supervisor

BIOSYSTEMS ANALYSIS, INC.

May 23, 1991

Dr. Ira Fink
Ira Fink and Associates, Inc.
University Planning Consultants
One Columbia Circle
Berkeley, CA 94708

Dear Dr. Fink:

This letter reports the results of our recent surveys of the Lawrence Berkeley Laboratory East Canyon site for state or federally listed threatened, endangered, sensitive, or special concern species (hereafter referred to as TES species). The site is proposed for a replacement hazardous waste handling facility for Lawrence Berkeley Laboratory. The following are our descriptions of surveys, findings, and conclusions for vertebrate and invertebrate TES species.

On May 7 and 9, 1991, Biosystems Analysis, Inc. (BioSystems), conducted a field reconnaissance on approximately 5 acres of land in Strawberry Canyon owned by the University of California. We looked for individuals of and habitat which could potentially support 5 vertebrate species:

the California tiger salamander (*Ambystoma tigrinum californiense*),

the California red-legged frog (*Rana aurora draytoni*),

the Alameda whipsnake (*Masticophis lateralis euryxanthus*),

the Townsend's western big-eared bat (*Plecotus townsendii townsendii*), and

the California mastiff bat (*Eumops perotis californicus*).

All five species are federal category 2 candidates for listing as threatened or endangered by the U.S. Fish and Wildlife Service, and all but the Alameda whipsnake are California species of special concern. The Alameda whipsnake is listed by the state of California as threatened. Further, because raptors are considered sensitive by the California Department

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of Fish and Game, we also evaluated the site for potential to support raptors.

The primary vegetation types on the site include eucalyptus (*Eucalyptus* spp.) woodl: coyote bush (*Baccharis* spp.) scrub, and non-native grassland. The eucalyptus woodland quite dense, with an understory of California bay (*Umbellularia californica*), poison (*Rhus toxicodendron*), and various introduced and native grasses and forbs. Eucalyptus t had recently been removed from the upslope portions of the site (i.e., above the transmis line), leaving a mixture of resident vegetation including baccharis scrub, non-native grassl: plus scattered coast live oaks (*Quercus agrifolia*) and California bays. An intermittent str channel cuts through the western portion of the site. At the time of the visits, there wa flow of water in the channel and storm runoff appeared to be the primary source of w: No pools or ponded water were noted. Vegetation associated with the upper portion o stream channel was coyote bush scrub and non-native grassland, while the lower portic the stream channel ran through the dense eucalyptus woodland.

No evidence was found to indicate the existence of any of the five vertebrate species or site. The dry drainages were not capable of supporting breeding populations of salamanders or red-legged frogs. The Alameda whipsnake generally requires cover prov by coastal scrub or chaparral in association with riparian habitat or areas of high mois content. Only scattered individuals representative of coastal scrub or chaparral commun exist on the site, and there was no permanent water, so suitable habitat does not exis

The western big-eared bat requires deep, dark roosting areas, such as caves and m They may use abandoned buildings. No such roosting sites exist on the site. The mastif prefers sheltered crevices of cliffs and rock canyons, which are not found on the Adjacent to the site is a small 50 ft x 30 ft rock face with some small crevices, but nor which this large bat would likely fit. No crevices in this rock face showed any signs of u stains or feces indicative of bat roosting.

No raptors or their nests were observed on the site although the large trees in the wooc area have the potential to support nesting individuals and may also serve as roosts.

The site was also surveyed by Dr. Richard Arnold for four TES invertebrate species:

the bay checkerspot butterfly (*Euphydryas editha bayensis*),

the San Francisco forktail damselfly (*Ischnura gemina*),

the callippe silverspot butterfly (*Speyeria callippe callippe*), and

the California linderiella fairy shrimp (*Linderiella occidentalis*).

The bay checkerspot butterfly (Lepidoptera: Nymphalidae) lives in serpentine grassland habitats, especially those with bunchgrasses. Its larval foodplants are *Plantago erecta* and *Orthocarpus densiflorus* (Scrophulariaceae). Today the checkerspot is known only from a handful of localities in San Mateo and Santa Clara counties, but it formerly occurred in the East Bay hills (Ehrlich et al. 1975) and at numerous other localities in the greater San Francisco Bay area.

The callippe silverspot butterfly (Lepidoptera: Nymphalidae) occurs in grasslands where its larval foodplant, *Viola pedunculata* (Violaceae), grows. Although it was formerly widely distributed throughout the San Francisco Bay area, today the butterfly is known only from San Bruno Mountain in San Mateo County, Joaquin Miller and Redwood Regional Parks in Oakland (Alameda County), and the hills of southern Solano County (Arnold 1981).

The San Francisco forktail damselfly (Odonata: Coenagrionidae) ranges throughout portions of Alameda, Marin, San Mateo, Santa Clara, and Solano counties (Garrison and Hafernik 1981). It is associated with open ponds or slow-moving drainages where there is pooling or ponding of water.

The California linderiella is a fairy shrimp (Anostraca: Linderiellidae) that lives in seasonally astatic vernal pools associated with grassland habitats. These pools are filled by winter and spring rains, but depending upon their size, depth, and permeability of the soil conditions, typically become dry within several weeks to a few months after filling with rainfall. This species of fairy shrimp is known from about 40 vernal pool and numerous pond localities scattered throughout California (Eng et al. 1990). They have been observed in pools that are clear or slightly turbid and with soils that are alluvial, hardpan, or muddy.

Dr. Arnold visited the site on May 7, 199~~2~~1 and searched for vegetation types, particular foodplants, and habitat conditions required by the four species named. He searched the entire project area, as well as adjacent areas located at the periphery of the project site. He found no suitable habitat for any of the four invertebrate species named, either on the project site or immediately adjacent to it.

The obligate larval foodplants of both the bay checkerspot and callippe silverspot butterflies were not observed at the project site or surroundings areas, thus these butterflies would not be expected to occur there. Similarly, because no vernal pools occur at the site, the California linderiella could not occur there. Due to the lack of water in the stream channel and the dense overstory of eucalyptus woodland, the San Francisco forktail damselfly would not be expected to occur on the project site either.

In conclusion, we believe that the proposed development does not represent a threat to :
TES vertebrate or invertebrate species. If you have any questions or require any furt
information on this matter, please feel free to call.

Sincerely,

John Garcia, Principal
BioSystems Analysis, Inc.

References:

Arnold, R.A. 1981. Distribution, life history, and status of three California lepidop proposed as endangered or threatened species. Calif. Dept. of Fish and Game, Inl Fisheries Branch. Final report for contract #S-1620.

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Garrison, R.W. and J.E. Hafernik, Jr. 1981. Population structure of the rare damse *Ischnura gemina* (Kennedy). Oecologia 48:377-384.