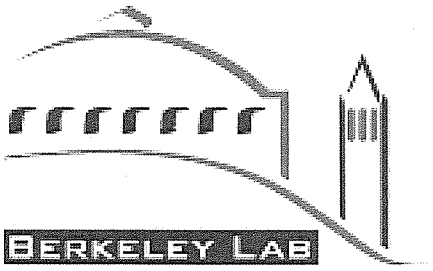

Storm Water Pollution Prevention Plan

Prepared by:
Environmental Services Group,
Environment, Health, and Safety Division
Ernest Orlando Lawrence Berkeley National Laboratory

March 2006
(Revision 4)

Prepared for the US Department of Energy under Contract No. DE-AC02-05CH11231

Lawrence Berkeley National Laboratory
Storm Water Pollution Prevention Plan Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

DAVID McGRAW

Signature

3·22·2006

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This Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab) Storm Water Pollution Prevention Plan (SWPPP) is the product of the LBNL Storm Water Working Group, which is made up of individuals from the LBNL organizations that will have responsibility for implementing it. Those responsibilities rest primarily with the Environment, Health and Safety Division for monitoring and analysis of potential hazards and pollutants; the Facilities Division for design and records pertaining to physical components of the system; and Operations and Maintenance within the Facilities Division for effective utilization and upkeep of the system. Ron Pauer, Group Leader, Environmental Services Group, was responsible for the initial Task Force charter and the successful acquisition of the necessary resources for preparation of this Plan and the Monitoring Plan. Those serving in the Working Group are listed below.

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Marty Johnson, Utilities Manager
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The structure of this document consists of introductory and background material followed by the major topics specified in the State Water Resources Control Board Water Quality Order No. 97-03-DWQ. This order addresses the state permit for Discharges of Storm Water Associated with Industrial Activities, or General Industrial Permit.

The intent is to provide both descriptions of LBNL policies that affect storm water runoff quality, many of which had been in effect long before outside concern for storm water quality arose, and the specific procedures that are necessary to carry out the state requirements for this Plan.

This SWPPP, revision number four, incorporates knowledge gained from 13 years of site storm water monitoring data, modifications to site operations and facilities as they affect storm water quality, and a document format that follows the current and expected General Industrial Permit requirements.

Revision Number	Description	Section(s)	Date of Revision
Rev. 0	Original Issue	All	9/30/92
Rev. 1	Update	All	6/30/97
Rev. 2	Update	All	6/1/98
Rev. 3	Update	All	6/1/02
Rev. 4	Update	All	3/1/06

Acronym	Description
BMP	Best Management Practice
cfs	Cubic Feet per Second
CFR	Code of Federal Regulations
CWA	Clean Water Act (Federal)
DOE	Department of Energy
DSA	Drum Storage Area
EBMUD	East Bay Municipal Utility District
FTU	Hazardous Waste Fixed Treatment Unit
HMBP	Hazardous Materials Business Plan
HWHF	Hazardous Waste Handling Facility
LBNL	Lawrence Berkeley National Laboratory (also Berkeley Lab)
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
SIC	Standard Industrial Classification
SPCC	Spill Prevention Control and Countermeasure Plan
SWMP	Storm Water Monitoring Program
SWPPP	Storm Water Pollution Prevention Plan
UC	University of California
USEPA	United States Environmental Protection Agency
WAA	Waste Accumulation Area
WDR	Waste Discharge Requirements

1.0 INTRODUCTION AND BACKGROUND

The Lawrence Berkeley National Laboratory is a multi-program national laboratory managed by the University of California (UC) on behalf of the US Department of Energy (DOE). Berkeley Lab conducts unclassified research across a wide range of scientific disciplines, with key efforts in fundamental studies of the universe; quantitative biology; nanoscience; new energy systems and environmental solutions; and the use of integrated computing as a tool for discovery. LBNL also supports nationwide university-based research by providing national facilities, including the National Center for Electron Microscopy, the Advanced Light Source, the Energy Sciences Network, and the National Energy Research Scientific Computing Center. Support functions for these operations at LBNL include handling and storage of hazardous materials, management of hazardous wastes (pre-treatment of waste waters, storage and/or treatment of hazardous waste in containers and tanks, and packaging and storage of low-level radioactive waste), metal finishing, vehicle maintenance, various fabrication and construction activities, and maintenance and operation of infrastructure and utilities. Normal operating hours are 8 a.m. to 5 p.m., Monday through Friday, although certain research and support functions are continuous.

1.1 REGULATORY BACKGROUND

The Federal Clean Water Act (CWA) was amended in 1972 to provide that point discharges of pollutants to waters of the United States are effectively prohibited, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 amendments to the CWA added Section 402(p), which established a framework for regulating municipal and industrial storm water discharges under the NPDES program. On November 16, 1990, the US Environmental Protection Agency (USEPA) published final regulations that established application requirements and authorized states to issue general or individual permits to regulate industrial storm water discharges.

The regulations require specific categories of industrial facilities to obtain an NPDES permit for storm water discharges associated with industrial activities. Such facilities that discharge industrial storm water either directly to surface waters or indirectly through the municipal storm drain system must be covered by a permit.

The California State Water Resources Control Board adopted the General Permit for Storm Water Discharges Associated with Industrial Activities in November 1991. With respect to LBNL, the permit requirements are implemented and enforced by the San Francisco Bay Regional Water Quality Control Board. As detailed below under 1.3, Applicability, LBNL must obtain an NPDES permit for industrial storm water discharges under these regulations. LBNL filed a Notice of Intent to comply with the General Industrial Permit requirements in March 1992. The Storm Water NPDES permit identification number assigned to LBNL by the State Water Resources Control Board letter of October 24, 1992, is 2 01S002421.

1.2 PURPOSE OF THE SWPPP

As part of the General Industrial Permit requirements, LBNL must develop and implement a Storm Water Pollution Prevention Plan. The purpose of the SWPPP is to identify sources of pollution that could affect the quality of storm water discharges, and to describe and ensure the implementation of practices to reduce pollutants in the storm water discharges.

The General Industrial Permit also requires development and implementation of a monitoring program. The objectives of the monitoring program are to: 1) demonstrate compliance with the permit; 2) aid in the implementation of the SWPPP; and 3) measure the effectiveness of the Best Management Practices (BMPs) in removing pollutants in industrial storm water discharges. The LBNL Storm Water Monitoring Program is issued as a separate document.

The SWPPP will be amended whenever there is a change in facilities, operations, or maintenance that may cause the discharge of significant quantities of pollutants to surface water, groundwaters, or the storm drain system; or upon review when it is found that the Plan has not achieved objectives. The Plan will be reviewed annually by the Storm Water Working Group.

1.3 APPLICABILITY

Several criteria exist to determine whether a facility's operations must be permitted under the storm water NPDES regulations. The General Industrial Permit refers to categories detailed at 40 CFR 122.26(b)(14). LBNL fits into two of these categories: facilities subject to toxic pollutant effluent standards (40 CFR Subchapter N), and hazardous waste treatment, storage, or disposal facilities. Because of metal finishing operations at buildings 25 and 77 (Standard Industrial Classification or SIC code 3499), LBNL is subject to toxic pollutant effluent standards, which are categorized as Category 1 discharges under the NPDES General Industrial Permit applicability criteria. Additionally, the operation of a hazardous waste treatment facility (SIC code 4953) also subjects LBNL to the General Industrial Permit.

A major criterion is whether or not the facility is engaged in industrial activities, as defined in the regulation. One criterion used to determine whether a facility is engaged in industrial activity is its SIC code. If a facility has an SIC code that is within one of the regulated categories, or fits the description of a category, it is probably subject to storm water permitting. Although LBNL's general classification is 8733, Non-commercial Research Organization, several of the secondary SIC codes under which LBNL is classified would require LBNL to be covered under the General Industrial Permit. These activities historically included, among others, gasoline dispensing (5541), transportation (4789), and car washing (7542). Therefore, LBNL decided to be covered under the General Industrial Permit for the site as a whole.

1.4 STORM WATER MANAGEMENT PROGRAM RESPONSIBILITIES

1.4.1 DOE Oversight

As a DOE contractor, LBNL is subject to DOE oversight. Local oversight is provided by the Berkeley Site Office, with supplemental oversight by the DOE office at Oak Ridge National Laboratory in Tennessee.

1.4.2 LBNL Operations Group

LBNL is managed by the Regents of the University of California under a contract with the DOE. The Director of LBNL delegates responsibility for various functions. The LBNL Associate Laboratory Director for Operations oversees the following organizational entities

- Environment, Health and Safety Division, which provides comprehensive support services to the entire Laboratory community.
- Facilities Division, which oversees the planning, design, and construction of physical plant structures, and includes Plant Operations, which is responsible for minor construction, operation, and maintenance of these facilities.

These organizations are responsible for implementing the following functions associated with the SWPPP:

Environment, Health, and Safety Division/Environmental Services Group

- Regulatory Agency Liaison
- Stormwater Working Group Coordination
- SWPPP Update and Revision
- Annual Facility Inspection
- Spill Reporting
- Identification and Mitigation of Pollutant Sources
- Training
- Storm Water Monitoring Planning and Implementation
- Fire Protection Services (through Security and Emergency Operations)

Facilities Division

- Facilities Planning
- Facilities Design
- Material Receiving, Storage, and Transport

- Vehicle Services
- Facility Modification
- Preventive Maintenance and Repair
- Plant Inspection (Routine)
- Erosion Control
- Contaminant Control
- Grounds and Vegetation Management
- Housekeeping
- Spill Response (non-hazardous)

2.0 SITE INFORMATION

2.1 LOCATION

Berkeley Lab is located within the cities of both Oakland and Berkeley in Alameda County. It borders the northeast side of the UC campus in Berkeley, between Centennial Drive and Gayley Road. The facility encompasses 203 acres of steep, generally southern- and western-facing hillside terrain at elevations of 450 to 1,000 feet above sea level. Figure 2-1 shows the vicinity of the LBNL site; topography may be seen in Figures 2-2 and 2-4. Approximately 110 acres, including steep slopes and vegetated areas, remain undeveloped.

2.2 CLIMATE AND RAINFALL

The average annual temperature at Berkeley Lab is in the mid-50's (Fahrenheit). More than 90% of the time, the temperature is in the range of 40° to 70°F. Seldom does the maximum temperature exceed 90°F or the minimum temperature drop below 32°F.

Winds are generally light and from the southeast during nighttime hours or in advance of approaching storms, and from the west-northwest during the daytime. The average wind speed for the year is less than five miles per hour. Wind speeds remain below 10 miles per hour more than 90 percent of the time. The highest winds are usually associated with storms.

The average annual precipitation from more than 30 years of records at Berkeley Lab is nearly 30.5 inches of rain for the season (October 1st to September 30th). Measurable snow does not fall at Berkeley Lab. About 95% of the annual rainfall occurs between October and April. The wettest of these months are typically December thru February. The El Niño phenomenon that occurred during the 1997-1998 rainfall year produced 59.7 inches of rain, double the normal rainfall and the greatest seasonal total dating back to 1974, when recording began. February of 1998 alone yielded 19.5 inches, or more than three times the normal monthly total.

2.3 FACILITY LAYOUT

Eighty permanent buildings at the LBNL facility are used for administrative offices, research and development laboratories; site maintenance and operations activities; a cafeteria; a fire response station dedicated to servicing the LBNL site; construction trade shops (plumbing, electrical, and mechanical); hazardous waste storage; vehicle fueling and minor maintenance operations; site maintenance operations crew yard; and shipping and receiving, stores, and warehouse activities. Approximately 108 smaller buildings and trailers are used primarily as offices, but also house monitoring stations, emergency generators, and chemical and waste storage facilities. Figure 2-2 shows the overall layout of buildings and

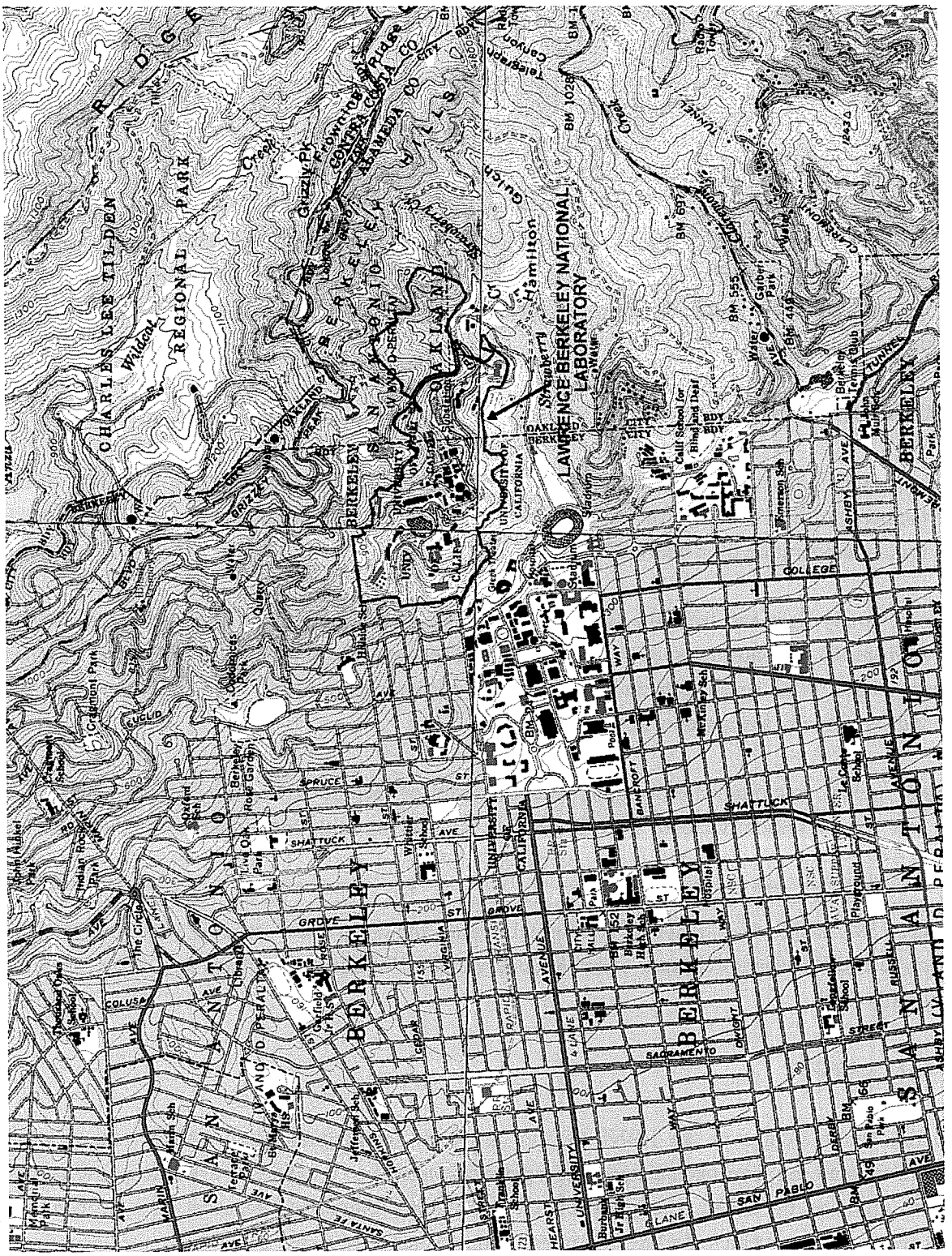

Figure 2-1. Vicinity Map

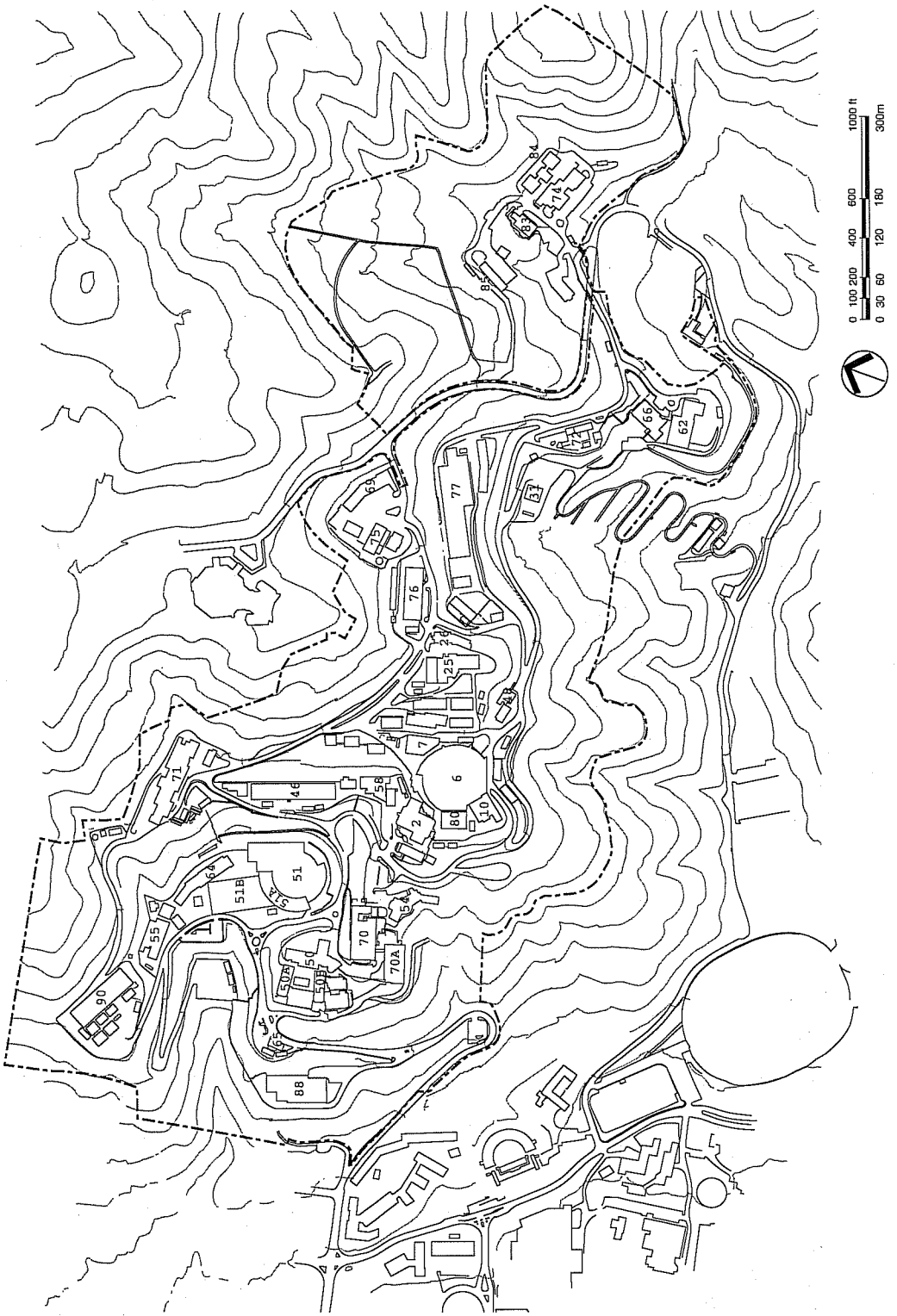

Figure 2-2. LBNL Buildings and Topography

structures at LBNL. An expanded description of areas where significant quantities of hazardous materials and/or wastes are handled, treated, or stored is included in Section 3.0 of this SWPPP.

2.4 DRAINAGE

2.4.1 Storm Drain System

Because of its hillside location and moderate annual rainfall, there is significant surface runoff from LBNL. LBNL is located within the Strawberry Creek watershed in an area characterized by three main canyons and related tributaries. A site-wide storm drain system, designed and installed beginning in the 1960s, discharges into the North Fork of Strawberry Creek watershed on the north side of LBNL and into Strawberry Creek on the south side (see Figure 2-3). This system had the capacity to handle storms with runoff intensities expected in a 25-year maximum-intensity storm. Any current upgrades or additions to the system are designed and constructed to handle runoff from the 100-year storm. LBNL is not located within a 100-year flood plain.

The Strawberry Creek watershed includes other UC property, public streets of both the cities of Oakland and Berkeley, and private property. The total Strawberry Creek watershed above Gayley Road contains about 878 acres. Figure 2-4 shows the area drained by each of five sub-watersheds.

The North Fork of Strawberry Creek watershed (Blackberry Canyon) is 170 acres comprised of steep canyons and hillsides covered with brush, trees, and grass. Within this area are LBNL buildings, parking lots, paved areas and other improvements, and up-slope buildings, roads, and parking lots belonging to UC, in addition to public roads and private property. Drainage from the North Fork of Strawberry Creek watershed within LBNL and from upper portions of the watershed above LBNL discharges to a 60-inch concrete culvert at the head of LeConte Avenue in Berkeley. On the south and east, and to a certain extent to the west, LBNL constitutes portions of three of the other four sub-watersheds (Stadium Hill, Chicken Creek, and Upper Strawberry). These sub-watersheds consist mainly of steep canyons and natural hillsides, but also contain LBNL infrastructure and some of the University of California's facilities, including the Botanical Garden. Southerly and easterly portions of LBNL discharge to Chicken Creek, Ten-Inch Creek, Ravine Creek, and Cafeteria Creek, as well as to other small tributaries, and then to Strawberry Creek.

On the south, Strawberry Creek is diverted through 36-in. and 48-in. diameter concrete pipes and emerges as a surface stream near the eastern end of the UC campus. The north and south forks of Strawberry Creek traverse the UC campus and join at the western side of the campus near Oxford Street. These waters are then directed into the City of Berkeley's Oxford and Center Streets culvert. Runoff from the entire upper watershed, including the UC campus, is delivered to the entrance of this culvert. The runoff flows through the City of Berkeley's storm drainage system and empties into San Francisco Bay.

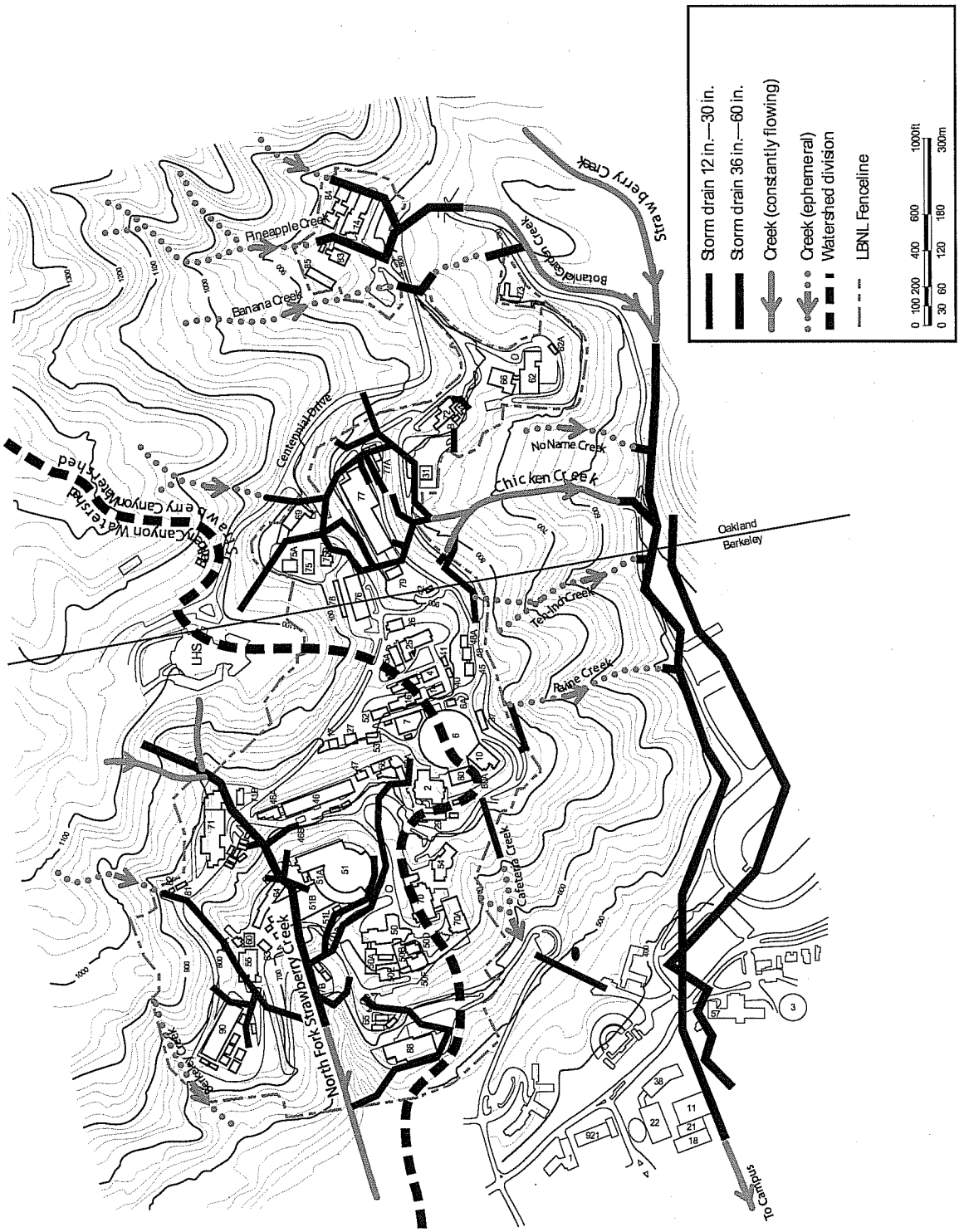

Figure 2-3. Stormwater Drainage

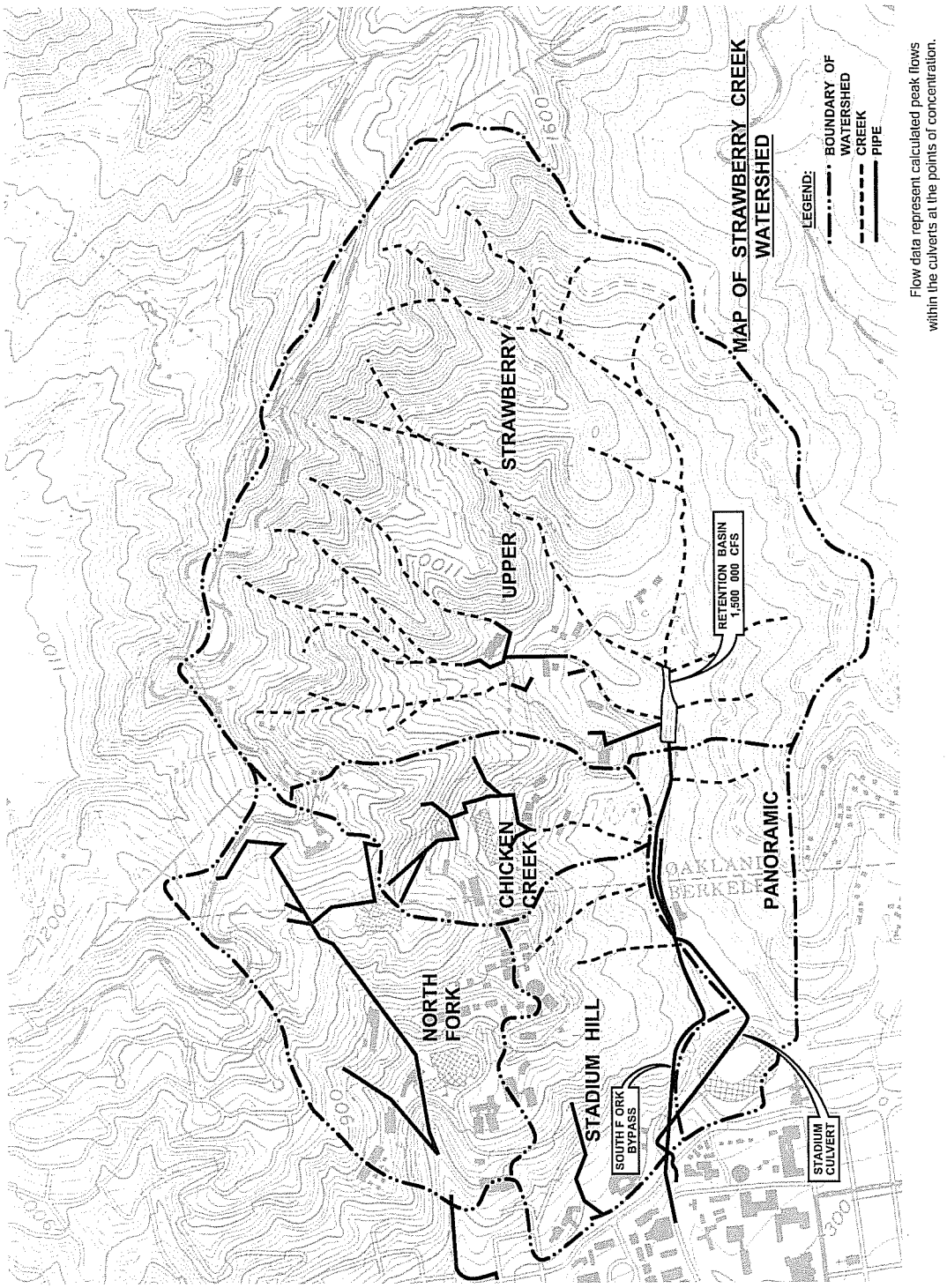

Figure 2-4. Strawberry Creek Watershed

2.4.2 Hydrogeology

The hydrogeology of the LBNL site is controlled by its complex stratigraphy, faults, and fractures. Locally discontinuous and perched water-bearing zones are common and are indicated by springs, seasonal surface seeps, and variable water levels in wells. These conditions are caused by several factors, including low permeability claystone and siltstone interbeds, pervious sandstone lenses, and fractured volcanic rock. Shallow groundwater, which varies from 0 to 90 feet below ground surface, appears to be perched on the contact between relatively low hydraulic conductivity Orinda Formation sediments below more permeable fractured Moraga Formation volcanics. In addition, the hydrogeology has been altered by a series of vertical wells and free-flowing sub-horizontal drains (hydraugers) installed to increase slope stability in the region.

Groundwater flow generally follows the surface topography southward toward the City of Berkeley, or toward the drainage streams (Strawberry Creek and its tributaries). This groundwater probably recharges groundwater aquifers beneath the UC campus and parts of the City of Berkeley. Such groundwater is not presently used as a source of drinking water for LBNL, the UC campus, or the City of Berkeley. The City of Berkeley allows the use of groundwater by individuals only for irrigation.

In recent years, LBNL has installed numerous groundwater monitoring wells to evaluate the environmental quality of the groundwater on site. Many of these wells are located at specific areas of environmental concern. Monitoring wells are also installed at the down-gradient edge of the site perimeter to monitor groundwater leaving the site.

Most of these wells are sampled quarterly to monitor changes (if any) in constituent levels. As part of the LBNL Environmental Restoration Program, additional groundwater monitoring wells are being installed to more precisely determine the hydrogeologic properties of the site and to characterize the extent of groundwater contamination. Additional wells, such as slope indicator and stability wells, and hydraugers, are also routinely monitored.

2.4.3 Storm Runoff

About 95 percent of the average annual rainfall of 30 inches at the LBNL site occurs from October through April, and intensities are seldom greater than one-half inch per hour. Thunderstorms, hail, and snow in the San Francisco Bay Area are extremely rare occurrences. Peak flow in Strawberry Creek at the LBNL boundary has not been measured, but calculations for various discharge points can be found in the "Storm Drainage Study of Eastern Portion of the Strawberry Creek Watershed," by G.T. Kuntz, a 2004 study commissioned by the LBNL Facilities Design and Construction Department. The peak runoff rate downstream at the lower end of the UC Berkeley campus was calculated to be about 1,700 cubic feet per second (cfs). Figure 2-5 shows the buildings, roads, and paved surfaces within the LBNL perimeter, which comprise the impervious areas of the site. This is approximately 35%. The remaining 65% of

pervious surface area is mostly steep hillsides covered with natural grasses and other vegetation to minimize erosion.

2.4.4 Authorized Non-Storm Water Discharges

Fire hydrant flushing, sprinkler flushing, and fire drills. The National Fire Protection Code requires that fire hydrants and sprinkler systems be flushed every 8 weeks for 30 seconds. This flushing water, which comes from the domestic supply, is allowed to enter the storm drain system. Flow from this source totals approximately 250,000 gallons per year. Fire equipment testing and drills account for a smaller amount of runoff, including fire hose cleaning, which may also enter the storm drain system. Procedures call for the use of thiosulfate tablets to minimize any contamination with chloramine to the extent possible.

Fire suppression runoff. In an emergency, water from fire hydrants or tankers used to suppress fires could enter the storm drain system. However, if it is determined by the emergency incident command that hazardous materials are involved, containment of the runoff will be initiated.

Water line breaks. Occasional breaks occur in the LBNL domestic water supply lines. The design of the system allows such leaks to be isolated as soon as discovered. Flow from water line breaks enters the storm drain system. Procedures call for the use of thiosulfate tablets to minimize any contamination with chloramine to the extent possible.

After two line breaks in nearly the same spot in 2003 and 2005, further corrective actions were instituted by Operations and Maintenance, including use of a 24-hour circular chart recorder, increased training sessions, new procedures, and re-evaluation of the water line system. The SWPPP was also reviewed with owl and swing shift maintenance technicians, and lessons learned were circulated.

Low conductivity cooling water system. During emergency conditions such as breaks in underground transfer piping or leakage from the aboveground storage tank, water from the Low Conductivity Cooling Water system could be released into soils or the ground surface. This water does not contain chemicals. The major uses of the cooling water (high energy magnets and power supplies) are closed-loop systems.

Safety shower/eyewash testing and operation. Some of LBNL's safety shower/eyewash stations are located on building exteriors. These stations are functionally tested every quarter. A very small quantity of tap water may be released during functional testing. Larger quantities of water containing dilute chemicals may be released to the ground around the unit during emergency use. If use were required during a storm event, drainage from the unit could enter yard storm water runoff.

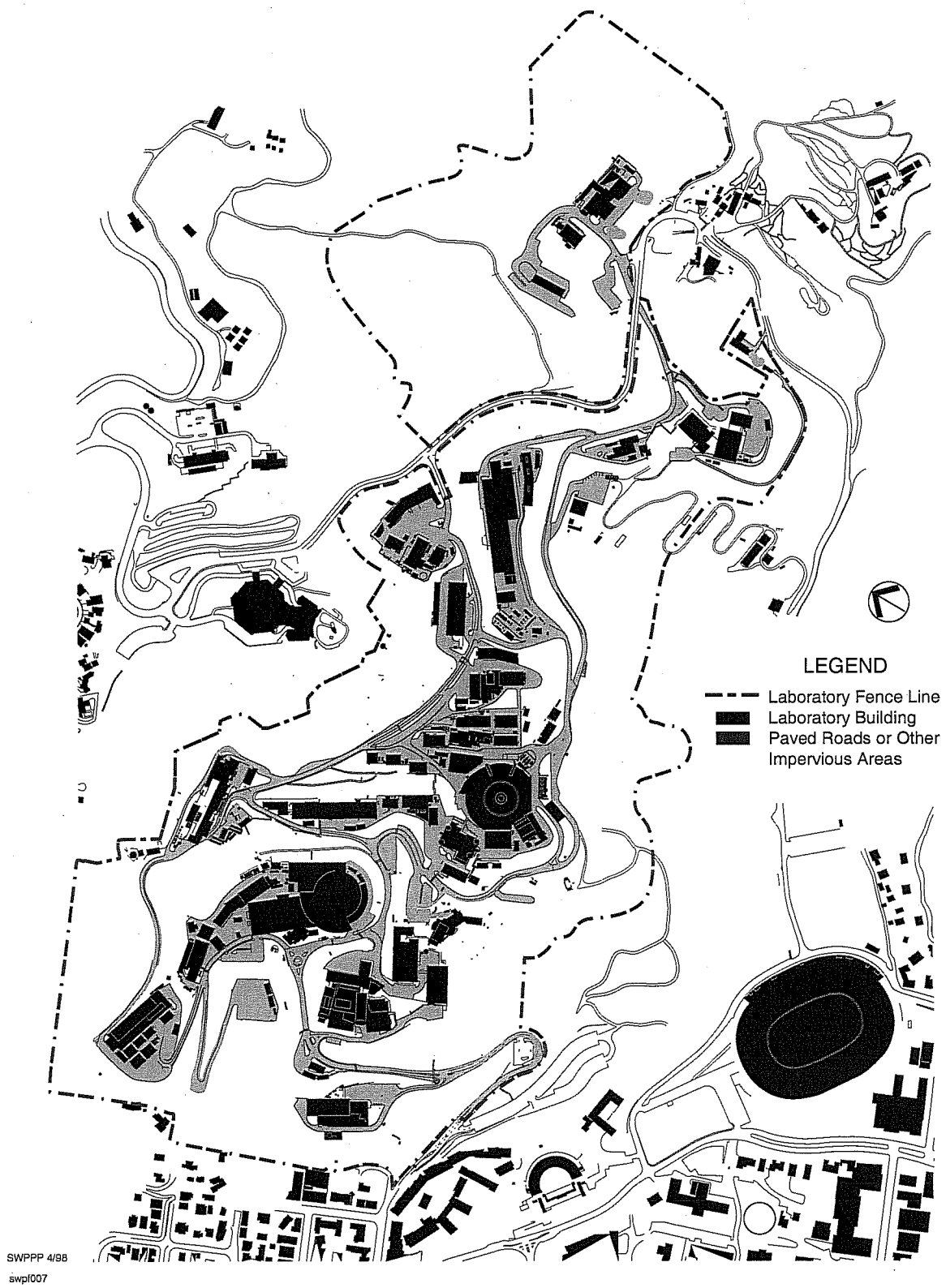

Figure 2-5. Impervious Areas at LBNL

Atmospheric condensates. Small quantities of condensed water from air conditioning, refrigeration, and compressor systems may be released to the ground on the exterior of LBNL buildings. It is not anticipated that this condensate would contain any chemicals. Condensate releases during a storm event could enter yard storm water runoff.

Landscape watering. Occasionally during the summer months some landscape watering is undertaken at LBNL. The amounts are small, and every effort is made to avoid over watering to the degree that water would flow to the storm drain.

Groundwater reaching the surface. These releases are from local springs, all-year creeks, and horizontal wells (hydraugers) installed to drain subsurface water to stabilize slopes. Environmental Restoration Program hydraugers typically flow at an average rate of 1/4 to 1/2 gallon per minute. Uncontaminated discharge from the hydraugers is routinely routed to the storm drainage system. At Buildings 7, 46, 51, and 51B, discharge of contaminated groundwater from hydraugers is collected and treated by granulated activated carbon systems before being released to the sanitary sewer under a permit from the East Bay Municipal Utility District (EBMUD).

Utility vault pump-outs. Accumulated water seepage into utility vaults may be manually pumped out on occasion. Following accumulation of any storm water in these vaults, water is checked for the presence of oil or an oily sheen on the water surface. If evident, the water is collected into a drum or vessel for disposal. On request, the Environment, Health, and Safety Division evaluates the accumulated storm water and advises on proper disposal methods. If there is no evidence of oil or sheen on the water, every effort is made to discharge pumped water onto soils.

2.4.5 Non-authorized Non-Storm Water Discharges

Sewer line breaks. A break or leak in the sanitary sewer system could accidentally flow to the storm drain system. However, such a breach of the sewer would represent an emergency condition, and LBNL would shut down the sewer as necessary and apply aggressive containment measures to prevent storm water system pollution.

Cooling tower spray. Small quantities of water spray from cooling towers located on the site may be released to the grounds and structures around the exterior of LBNL buildings where cooling towers are located. This water may include corrosion and scale inhibitors, biocides, and occasionally chlorine to prevent algae, rust, and scale buildup in cooling water. It is not anticipated that this spray would contain significant quantities of pollutants. Many cooling towers on-site are enclosed to minimize the amount of spray released. Any new towers installed will be of this type.

Vehicle washing. Rinse water from washing of oversized vehicles may be discharged to the ground surface, not to storm drains, at the washing location. However, use of soap for oversized vehicle washing

is not allowed, and some larger vehicles are taken off-site to a commercial facility. Buses are now washed in a covered facility with a trench that collects washwater and routes it through an oil-water separator and then to the sanitary sewer.

Currently the Fire Department washes its trucks at the firehouse with a biodegradable detergent, minimizes water use so that much water evaporates before it reaches the storm drain, and uses thiosulfate tablets to neutralize the chloramine in the water supply to the extent possible.

Small maintenance and repair work cleanup. Cleanup from small facility and grounds maintenance and repair work by LBNL laborers may include rinsing of containers and hand tools. Laborers are typically engaged in repair and maintenance activities such as saw-cutting, trenching, digging, and small building and grounds surface repairs. Rinse water is typically limited to a few gallons, which is discharged to the ground surface in the staging area outside Building 31. Sandbags are used to promote infiltration of rinse water into the surrounding soils.

3.0 POTENTIAL SOURCES OF POLLUTION

The major potential sources of pollution to storm water runoff at LBNL are automotive vehicles and earthwork operations during construction. The use of contaminants in scientific experiments and industrial support operations also presents the potential for spills. However, most of these operations are conducted indoors or at facilities with suitable safeguards to prevent any pollution of the outdoor environment. Therefore, the three major routes by which potential contaminants might enter storm water runoff are:

1. contamination of outdoor surfaces over which storm water runoff may pass (e.g., contamination by leakage from outdoor storage areas such as waste accumulation areas or outdoor equipment, drippings from roadway traffic, construction activities, and deposition on ground surfaces of airborne pollutants,
2. accidental releases or escape of chemicals from indoor operations to unprotected exterior areas where storm water could come in contact with pollutants, and
3. contamination of groundwater that reaches the surface and enters the storm drain system.

LBNL's Storm Water Monitoring Plan (SWMP) contains a comprehensive listing of waste accumulation areas, drum storage areas, hazardous waste treatment units, and above- and underground storage tanks at LBNL, as well as outdoor equipment such as electrical transformers and cooling towers, which could contain storm water contaminants. The SWMP lists potential sources of storm water pollution and potential contaminants throughout the site, organized by storm water discharge point.

Based on a review of LBNL operations, on-site activities with significant potential for pollutants to come into contact with storm water are summarized below.

3.1 MATERIALS MANAGEMENT

Materials management activities at LBNL include material loading and unloading during delivery and shipment, movement of materials around the site (materials in transit), storage and use of materials in facility operations, waste management activities, and radionuclides.

The LBNL Environment, Health, and Safety Division maintains an inventory of all chemicals and storage locations at LBNL. This inventory is maintained by the Industrial Hygiene Group and is submitted to the City of Berkeley annually as the Hazardous Materials Business Plan (HMBP) in accordance with California Business Plan requirements. The Waste Management Group maintains an inventory of materials at its Hazardous Waste Handling Facility.

General categories of hazardous materials in use on the site are listed in summary form below. The contents of above- and underground storage tanks, predominantly petroleum products, are not included in this list (see Section 3.1.3.2).

- Ethylene glycol, diethyl ether, glycol ether
- Raw metals for use/recycling
- Acids; dilute and strong concentrations
- Caustics; dilute and strong concentrations
- Organic solvents
- Halogenated solvents and polychlorinated biphenyls (PCBs)
- Plating solution raw chemicals; caustics, specialized cleaners, and plating bath additives
- Radionuclides and tritiated water
- Waste metal-containing sludges from FTUs 002 and 006; waste oily sludges from FTU 003.
- Drinking water; considered a contaminant since EBMUD uses chloramines as a disinfectant.

3.1.1 Loading and Unloading

Potential for storm water pollution from loading and unloading operations exists from direct release of contaminants to storm drains or contamination of the ground surface through breakage and leakage of containers of up to 55-gallon size. LBNL's Receiving Area is located at Building 69 and encompasses most of the new material receiving at the site. Drums of new liquid materials are transferred from Building 69 for storage at the Bulk Storage Facility (Building 77D). Other transfers would include those to and from Waste Accumulation Areas (WAAs), which are located throughout the site (see Figure 3-1). Hazardous waste is ultimately transferred to the Hazardous Waste Handling Facility for consolidation, packaging, and storage, pending off-site disposal.

LBNL is also permitted to operate five on-site fixed hazardous waste treatment systems where chemicals and/or wastes could be loaded or unloaded:

- **Building 25; FTU 002;** Aqueous waste containing metals and inorganic acid waste streams treated by precipitation and pH adjustment
- **Building 76; FTU 003;** Oil mixed with water treated by phase separation (oil-water separation)
- **Building 70A; FTU 004;** Inorganic acid treated by pH adjustment
- **Building 2; FTU 005;** Inorganic acid treated by pH adjustment
- **Building 77; FTU 006;** Aqueous waste containing metals and inorganic acid waste streams treated by precipitation and pH adjustment

Potential solid and liquid storm water contaminants associated with LBNL loading and unloading operations encompass virtually the entire spectrum of materials used or stored at the site (see Section 3.1).

3.1.2 Materials In Transit

Potential storm water contaminants associated with transit of containers include any liquid or solid material that is used or stored at the site in a drum storage area (DSAs) and any waste stream generated at the site that is placed in a waste accumulation area in a container for disposal that could be released if a container was broken or overturned with a lid not fully closed during transit (see Section 3.1).

3.1.3 Materials Storage and Use

There are three general categories of outside storage or handling of materials at LBNL:

1. Containers:
   - Waste Accumulation Areas
   - Drum Storage Areas
   - Trash Dumpsters and Hoppers
   - Hazardous Waste Handling Facility
2. Tanks:
   - Underground Storage Tanks
   - Aboveground Storage Tanks
3. Outdoor Equipment Containing Chemicals

3.1.3.1 Containers (WAAs And DSAs)

Potential storm water contaminants associated with storage of containers include any liquid or solid material that is used or stored at the LBNL site and any waste stream generated at the site that is placed in containers for disposal that could be released if a container deteriorated or was damaged during storage (see Section 3.1). Loading and unloading activities at the Hazardous Waste Handling Facility are also a potential source of storm water contamination. Receptacles for solid waste and recycling can also present a problem because of old containers or possible disposal of inappropriate materials. The metal hoppers used on-site do not have lids. While most trash dumpsters now have lids, personnel do not always keep them closed.

3.1.3.2 Above- And Underground Tanks For Bulk Storage Of Liquids

Above- and underground tanks containing liquids are in use at the LBNL site. Approximately 80 aboveground storage sites, most of which are less than 55-gallon capacity, are in use at the site, including petroleum storage and electrical transformers. Bulk aboveground liquid storage tanks are used for storage of petroleum hydrocarbons. Tanks associated with the hazardous waste treatment units (FTUs 002 through 006) are also classified as aboveground tanks. Due to secondary containment, it is unlikely that the contents of aboveground tanks would be released to storm drains even if materials overflow to the

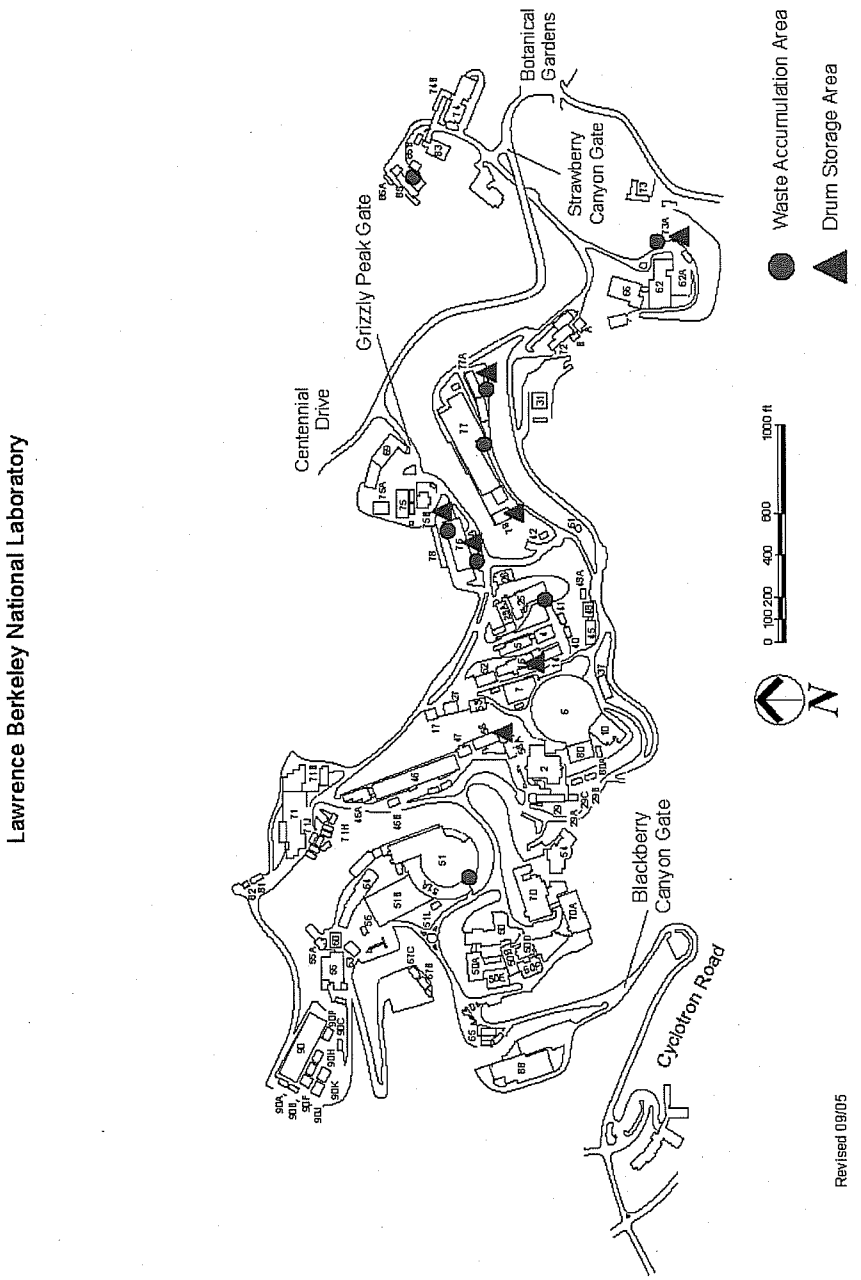

Figure 3-1. Waste Accumulation and Drum Storage Areas at LBNL

tank exterior during filling or draining operations or if tanks deteriorate or become damaged. All petroleum aboveground storage tanks containing more than 42 gallons have secondary containment.

In 2004, a 4,000-gallon aboveground storage tank was installed at building 76 near the diesel/gasoline fuel pumps. This tank contains E-85, a mixture of 85% ethanol and 15% gasoline, which is used by flexible fuel compatible vehicles in the Berkeley Lab fleet. These vehicles and their use of E85 fuel helps LBNL achieve requirements placed upon federal agencies for using alternative fuels and reducing petroleum dependency (Executive Order 13149).

Six underground storage tanks are currently in use at the site, all of which contain petroleum hydrocarbons. Materials can be released during tank filling operations. Waste oil tanks are not in use at this site.

Potential storm water contaminants associated with operation of above- and underground tanks at this site include petroleum-based fuels, transformer oil, and hazardous waste streams.

3.1.3.3 Outdoor Equipment

Transformers. Outside electrical transformer banks are filled with transformer oil, which could be released if equipment is damaged or poorly maintained. Transformers containing more than 42 gallons have secondary containment.

Cooling Towers. Cooling towers use chemicals such as descalers, chlorine, and corrosion inhibitors in water treatment. Treated water could be released if equipment is damaged or improperly maintained.

Generators. Standby electrical generators that contain petroleum-based fuels are in use at LBNL. All outdoor generators are equipped with secondary containment systems.

Groundwater Treatment Systems. Groundwater treatment system components such as granular activated carbon beds are in use to remove volatile organic compounds from contaminated groundwater at several locations at the LBNL site. Influent water to this treatment system could be released from transfer piping or the granular activated carbon drum if equipment is damaged or improperly maintained.

3.1.4 RADIONUCLIDES

Radionuclides may be released to the atmosphere from research activities conducted at LBNL. These research activities are dynamic and new projects may occur at new locations. Potential storm water contaminants associated with activities where radionuclides are used and/or stored include a variety of alpha and beta emitters.

3.1.5 PREVIOUS PRACTICES

Due to historical releases, areas where groundwater has been impacted by contaminants exist at the site. LBNL's program to address groundwater impacts is summarized in Section 4.4.5 of this plan.

3.2 VEHICLES

A fleet of facility vehicles is maintained by LBNL, which requires vehicle washing, fueling, and minor service. Private vehicles are also parked in designated parking areas.

3.2.1 WASHING AND SERVICING

LBNL performs vehicle fueling and minor vehicle servicing at a centralized location on the site (Building 76) for its motor pool vehicles. Exterior washing of motor pool vehicles is performed at an offsite dedicated vehicle washing facility. Minor repairs and washing of fire trucks may be conducted at the on-site Fire Station, Building 48.

Potential storm water contaminants associated with vehicle washing and servicing activities include:

- vehicle wash water containing oil, grease, and/or metals that are not captured by the wash water station trenching
- vehicle fuels accidentally released to the fueling pad
- motor oil, grease, antifreeze (ethylene glycol), hydraulic fluid, and other vehicle maintenance fluids accidentally released outside the building.

3.2.2 PARKING/DRIVING

There are numerous roads and vehicle parking areas within the LBNL site (see Figure 3-2). Potential storm water contaminants associated with vehicles include oil and other minor automotive fluid leakage from cars onto paved and unpaved areas. Other contaminants associated with roads and vehicle usage onsite include copper from brake pads and zinc from tires.

3.3 CONSTRUCTION AND MAINTENANCE ACTIVITIES

Construction is a common activity at LBNL, including new building construction, renovation, and grounds maintenance and infrastructure work such as expansion of electrical capacity and installation of tanks and other equipment.

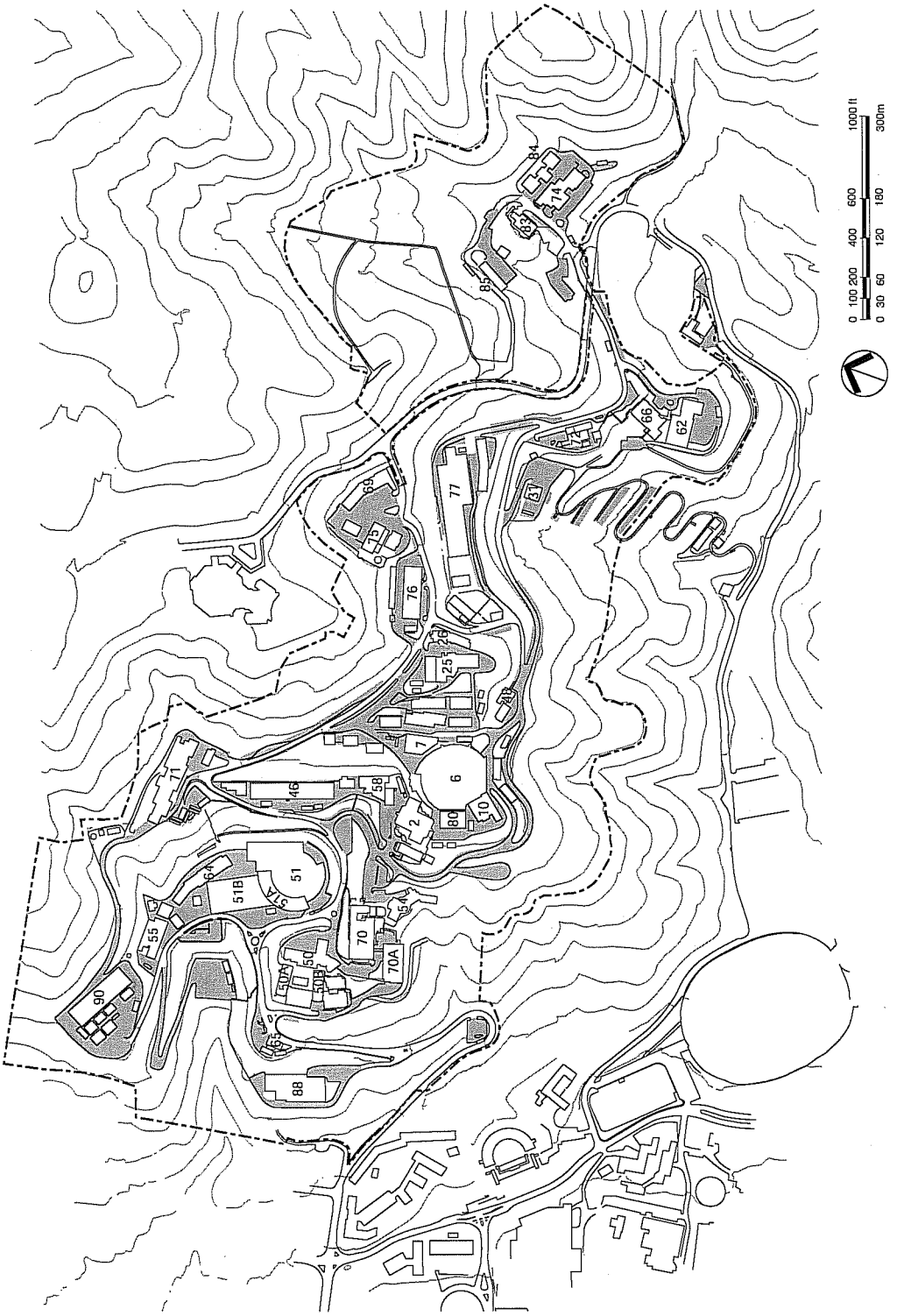

Figure 3-2 Parking Areas at LBNL

The California NPDES General Construction Stormwater Permit currently requires separate storm water permits for construction activities totaling more than one acre in size. LBNL therefore acquired such a permit for the Molecular Foundry project in 2004, and has remained in compliance with it for nearly two years. It is expected that the Notice of Termination for this project will be submitted during the first half of 2006, when the Molecular Foundry project is completed and the site will be subsumed under the sitewide General Industrial Stormwater Permit. It is expected that further separate permits will be needed for various phases of the demolition of Building 51.

Potential storm water contaminants associated with construction activities include:

- excavated materials (dirt, gravel, asphalt, concrete)
- eroded soil and sediment
- contaminated excavated materials
- new fill or roadbed material stockpiled awaiting placement
- equipment washout residue (cement trucks and smaller containers, cleanup of paints, caulking compounds and sealants, adhesives)
- effluent generated from saw-cutting operations
- spillage of containers of liquid chemicals such as paints, coating materials, adhesives and caulking compounds
- discarded demolition and construction materials such as glass, specialty papers, treated woods, and gypsum wallboard
- lead- or asbestos-containing construction materials
- mud or soil spread beyond the boundaries of the construction site by truck traffic.
- dust generated during construction
- wash-down water from concrete form construction and pouring operations;
- improperly maintained heavy equipment that may leak.

3.4 SIGNIFICANT SPILLS AND LEAKS

SWPPP requirements include a description of materials that have spilled or leaked in significant quantities in storm water discharges or non-storm water discharges since April 17, 1994. Two larger releases of drinking water have occurred from breaks in distribution lines in the same area behind building 51, one in August of 2003, and one in June of 2005. Drinking water is of concern because of the chloramines added by EBMUD as a disinfectant, and because Berkeley Lab storm drainage discharges directly into Strawberry Creek. Both releases (the former estimated at 50,000 gallons, the latter at 400,000 gallons), were reported to the Water Board, and appropriate corrective actions were implemented.

While other spills and releases have occurred on-site from time to time, no other stormwater or non-stormwater discharges have been released to the storm drain system. If "legacy" materials, i.e., mercury

or PCBs, are found in pipes or catch basins during excavations or remodeling, emergency measures are taken to protect nearby storm drains, and samples are taken downstream at outfalls to ensure that such materials have not entered the creek.

4.0 BEST MANAGEMENT PRACTICES

Protection of water quality includes maintaining desired uses such as swimming and fishing, and preserving aesthetic parameters such as cleanliness of the watershed areas and clarity of water. The Water Quality Control Plan for the San Francisco Bay Basin, known as the Basin Plan, is created by the Regional Water Quality Control Board. It defines the various watersheds within the area and establishes the beneficial uses, which are to be supported by the water quality goals. According to the latest (1995) version of the San Francisco Bay Region Basin Plan, LBNL lies within the Central Basin. Strawberry Creek is not specifically mentioned in the Plan, but beneficial uses for the nearest listed water body, the Berkeley Aquatic Park Lagoon, include fish migration, water contact recreation, noncontact water recreation, fish spawning, and wildlife habitat.

Best management practices are defined as actions that prevent or reduce the amount of pollution generated by non-point sources to levels compatible with water quality goals. Specific effluent limitations for pollutants in storm water have not been established.

An essential component of protecting water quality is the elimination of pollutants such as contaminants from industrial activities, oil and grease, non-naturally occurring metals, oxygen-demanding substances such as plant debris, radioactive substances, and bacteria and viruses in the water system.

Three categories of BMPs are usually considered for reducing pollutants in storm water: source controls, management controls, and treatment controls. This section of the SWPPP describes source control BMPs in place for specific potential sources of storm water pollution (as listed in Section 3.0), as well as general source controls, management controls, and treatment controls.

4.1 SOURCE CONTROL BMPs

Source controls are physical measures implemented at a facility to manage pollutants to eliminate or significantly reduce contact between the pollutant and storm water. Examples of general source controls include housekeeping, indoor storage of chemicals when possible, containment systems for leak and spill control, labeling of storm drains to increase awareness of drain locations and allowable drainage, elimination of illicit connections to storm drains, maintenance of storm drains and streets to remove organic material and dirt so as to reduce sedimentation and the presence of oxygen-demanding materials in the storm water stream, and prevention of sedimentation and erosion from unpaved areas and construction sites.

General source controls that have been implemented at LBNL to reduce potential for pollutants to come into contact with storm water are described below starting in Section 4.4.

4.2 MANAGEMENT CONTROL BMPs

Management controls are programs developed and implemented by facility personnel to eliminate or significantly reduce contact between the pollutant and storm water. Management controls include: assignment of responsibilities and authorities to implement the SWPPP (see Section 1.4.2); preventive maintenance of equipment and structures (see Section 4.5.2); housekeeping (see Section 4.5.1); spill prevention and response programs to adequately respond to unplanned releases (see Section 4.6.6); storm water construction controls (see section 4.6.8 and section 5); erosion and sediment controls (see Section 4.5.4); training for employees to identify and eliminate pollutants in storm water (see Section 4.6.7); design and implementation of post-construction controls (see section 4.6.9 and section 5); and implementation of inspections, monitoring programs, and associated record keeping to demonstrate a record of compliance with storm water protection measures (see Sections 4.6.1 and 4.6.2).

4.3 TREATMENT CONTROL BMPs

Treatment controls include measures to treat collected storm water prior to discharge such as oil-water separators, infiltration basins, etc.

LBNL has implemented source and management controls, which have proven effective, based on storm water monitoring results. Treatment of storm water to remove pollutants is not in general implemented at this facility. There is one stationary oil-water separator at the fuel pumps at building 76 designed to passively separate fuel and oil from water in stormwater run-on to the area, and to act as a first line of defense in case of any spills. Additionally, the Molecular Foundry has incorporated a Continuous Deflection Separator at the downstream end of the storm drain system installed in conjunction with this project.

4.4 ACTIVITY-SPECIFIC BMPs IMPLEMENTED AT LBNL

LBNL implements BMPs for specific activities involving potential pollutants at the site to minimize the potential for these substances to enter the storm water system. This section describes BMPs that have been implemented in connection with activities involving materials management, vehicles, and construction and maintenance, ordered as in section 3. They are often a mixture of source and management controls.

4.4.1 MATERIALS MANAGEMENT

Materials management activities include all loading and unloading of materials, transit between storage and use locations, storage and use of materials, and special management activities associated with radionuclides.

4.4.1.1 Loading And Unloading

Handling and spill containment procedures are designed to recognize and manage risks associated with container breakage and spillage during loading and unloading and proper response if an accident does occur.

Procedures for safe handling of materials during loading and unloading are specified in the LBNL Packaging and Transportation Safety Manual. Spill containment and reporting and/or calling in emergency response services are included in the instructions.

The following BMPs have been implemented for LBNL material loading and unloading activities at the site:

- Materials are handled only in designated and dedicated materials loading and unloading areas which provide adequate access and aisle space for safe handling
- Appropriate equipment for moving containers is available and maintained in good working condition
- Procedures and training for container handling, equipment use, inspection, and spill response are provided to all personnel responsible for materials handling.

4.4.1.2 Materials In Transit

Chemicals are handled from the time they are received on site, through transport to users' laboratories or facilities, to disposition into a managed and monitored waste stream in accordance with the HMBP and documents referenced in it. Procedures are provided to prevent unaccounted for releases, including into storm water drainage. Although not required by statute, LBNL voluntarily submits a chemical inventory list in the HMBP annually to the City of Berkeley.

Handling and spill containment procedures are designed to recognize and manage risks associated with chemical transport, which include damage to and breakage of containers during transport and during a major vehicle accident or minor collision, unattended loads, and receipt and transport of damaged containers.

Procedures for safe handling of materials traveling between storage areas and ultimate users or disposal are specified for LBNL transportation personnel. Drivers who handle hazardous materials must be trained and receive California Department of Motor Vehicles certification for hazardous materials handling. Spill containment and reporting and/or calling in emergency response services are included in the instructions and training for these drivers.

The following BMPs have been implemented for LBNL activities involving materials in transit at the site:

- Drivers of vehicles containing hazardous materials are specially trained on proper container handling and lifting, package integrity, container receipt, and spill response procedures
- Only specialized vehicles are used for transport of chemicals, which allow loads to be properly secured in a manner appropriate for the type of container being transported
- Speed limits on the site are 25 miles per hour or less and are clearly posted throughout the site
- Vehicles with loads in transit are not left unattended
- All deliveries of hazardous materials, including those within site boundaries, are accompanied by shipping and receiving documentation.

4.4.2 MATERIALS STORAGE AND USE

Every location used for outside storage of any material is under the specific control and responsibility of an operating organization (a department or division) of LBNL. Procedures for proper handling and appropriate storage of each substance are specified, and inspections for compliance are carried out by the Environment, Health, and Safety Division. In general, the management of materials is conducted in containers, tanks (above- and underground), and equipment. LBNL's policy is to conduct operations involving chemicals indoors as much as practical.

General BMPs include the following:

- LBNL's hazardous waste management program specifies procedures for handling and containment of hazardous wastes
- Any leakage from containers, above- or underground tanks, or electrical equipment is identified and noted for cleanup during routine site inspections or by any personnel working in the area where the release has occurred
- Storm water inspections and housekeeping are carried out during times of minimum parking occupancy (e.g., weekends, holidays) when the ground surfaces are most exposed for visual inspection.
- Storm water that is collected in WAA or tank secondary containment basins or traps is visually inspected for evidence of contamination, as from equipment leakage, prior to being released to the storm drain system.

BMPs specific to these storage types are listed below.

Containers (WAAs and DSAs). Smaller quantities of chemicals in containers at waste accumulation areas and drum storage areas are not routinely stored on the exterior of buildings unless protected by secondary containment units or within locked chemical storage cabinets. Most WAAs and DSAs are located indoors or are locked containers with secondary containment. Bulk storage areas have been

redesigned to reduce the possibility for leakage, and have been sheltered so that they will not affect storm water discharges. The main bulk storage area, completed in September 1995, is located at Building 77D and was designed for storage of solvents and oils. The Hazardous Waste Handling Facility stores all materials either inside or in sheltered and covered areas. See Section 4.6.3 for further information on hazardous waste management.

Containers (trash dumpsters and hoppers). Employees are trained on proper disposal of hazardous materials and wastes. All large metal trash dumpsters have been labeled with a sign that reminds employees to keep lids closed. Through training and outreach in Lab publications, employees are made aware that trash containers should be kept closed when not in use and/or stored under a roof or overhang to prevent rainwater from getting into the container and possibly leaking out. A separate effort relating to the open metal hoppers used on-site has been started with the Facilities Transportation Department, which is responsible for the open metal hoppers used on site, and individual divisions and buildings which use them. The goal is to reduce use of these hoppers, ensure that only non-hazardous materials are placed in them, and have them either covered or placed under shelter if they need to be used.

Above- and Underground Tanks for Bulk Storage of Liquids. Bulk aboveground liquid storage tanks (greater than 42 gallons, for oil) and hazardous waste treatment tanks are equipped with secondary containment systems. Containment volume of secondary containment is sufficient to contain the entire contents of the largest single container plus sufficient freeboard to allow for precipitation from a 25-year, 24-hour storm event. Underground storage tanks are equipped with leak detection and monitoring equipment per current regulations.

In addition, LBNL maintains a Spill Prevention, Control, and Countermeasures (SPCC) Plan to identify potential releases and mitigation measures. All facility containment modifications had been implemented by end of fiscal year 1995. To the extent possible, oil-filled transformers are gradually being replaced by dry-type transformers.

Outdoor Equipment. Aboveground storage tanks, cooling towers, and electrical equipment located outside are equipped with secondary containment. These containment structures are equipped with basins with locked drain valves. Following accumulation of any storm water in these basins, water is checked for the presence of oil or an oily sheen on the water surface. If evident, the water is collected in a drum or vessel for disposal. If requested, the Environment, Health, and Safety Division collects samples of accumulated rainwater and advises on proper disposal methods. If there is no evidence of oil or sheen on the water, it is released to the storm drain system.

A Facilities Division procedure entitled "Rainwater Disposal" codifies the above actions. Another procedure maintained by the Waste Management Group (EH&S Procedure 870) applies to the discharge of storm water through the storm drains in the yard at the Hazardous Waste Handling Facility.

Most piping used to transfer hazardous wastes is double contained. The only exception is piping to the treatment units at buildings 2 and 70A, which as Conditionally Authorized units under the state's Tiered Permitting system are exempt from the requirement for double-contained piping.

Equipment is routinely inspected for condition, and maintenance is conducted to ensure that leaks and damage that could result in releases are minimized.

During 1998, FTU 001 at building 77 was officially closed and dismantled. All its functions were taken over by FTU 006, a larger, more modern 60-gpm treatment unit, which was completely enclosed and roofed to protect stormwater. Ion-exchange equipment for recycling purified water at that facility is similarly enclosed.

Groundwater Treatment Systems. Groundwater treatment system components are routinely inspected and maintenance is conducted to ensure that leaks and damage, which could result in releases, are minimized.

4.4.3 RADIONUCLIDES

Radionuclide emissions are controlled in accordance with 40 CFR 61, Subpart H, National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities. Use is controlled in accordance with 10 CFR 835. LBNL maintains compliance with applicable requirements through the LBNL Radiological Work Authorization Program. This program tracks the use and inventory of all radionuclides at the site. The sampling and monitoring program strategy for surface water developed to comply with applicable DOE requirements includes evaluation of rainwater and creek samples for alpha and beta emitters and tritium, in addition to the monitoring of storm water runoff in compliance with the General Industrial Permit. The site Environmental Restoration Program (see below) additionally monitors groundwater, hydraugers, and some creeks.

4.4.4 PREVIOUS PRACTICES

Previous practices, which resulted in groundwater contamination, have been discontinued, and LBNL has conducted a site-wide soil and groundwater investigation project under the Environmental Restoration Program. LBNL is characterizing the contamination and implementing remedial action to reduce contaminants in groundwater and soil to acceptable levels or eliminate them entirely. LBNL is working closely with a consortium of agencies on applicable cleanup levels and locations where investigation and remediation are required. In 2005, the RCRA Corrective Measures Study was approved by the Department of Toxic Substances Control , so that final remediation measures can begin. In some areas where groundwater has been impacted by contaminants, treated discharge from hydraugers is discharged to the sanitary sewer system under a specific permit from EBMUD.

4.4.5 VEHICLES

Employee and visitor cars, contractor vehicles, including cars and trucks, and LBNL vehicles are parked at the site. LBNL vehicles include cars, pickup trucks, shuttle buses, delivery and transportation vehicles, and fire trucks.

4.4.5.1 Washing and Servicing

The following BMPs have been implemented for LBNL vehicle washing and servicing at the site:

- All major vehicle servicing and repair operations are performed off-site.
- Washing of government vehicles also occurs off-site at a commercial facility. Procedures prohibit the washing of personal vehicles.
- Minor vehicle maintenance is performed indoors in the Motor Pool area at Building 76. A commercial firm comes on site and performs oil changes on fleet vehicles with special equipment designed to prevent releases.
- All drainage from the covered, enclosed vehicle wash station in this building is routed through an on-site oil-water separator system (FTU 003), which discharges to the sanitary sewer system under the site's industrial wastewater discharge permit. Only exterior vehicle washing (i.e., no engine or undercarriage washing) is conducted at this station. Steam cleaning is not used. Larger vehicles up to bus size can now be accommodated at this wash station.
- Washing of oversize vehicles that cannot be accommodated at the enclosed washing area is performed without soap, or vehicles are sent to a commercial carwash.
- The fueling station for leaded and unleaded gasoline, and E85 (85% ethanol, 15% unleaded gasoline), is located outside on a concrete pad in an asphalt-paved area. Special training on storm drain protection has been provided to the bus drivers and others who use the fueling station.
- A sump to contain possible spills at the fueling station was installed during FY 98. The sump is equipped with a stationary oil-water separator and is regularly inspected and maintained by skimming any oil off the surface.
- An effort is being made to place a roof over the fueling station. However, this has not been funded, and no implementation date can be given.
- Fire trucks are washed at the firehouse, using a biodegradable soap and minimizing water use to the extent possible. Thiosulfate tablets are also placed in the nearest catch basin to neutralize the chloramine in the water supply.

Provisions of the LBNL SPCC Plan apply with respect to fuel spillage.

4.4.5.2 Parking

Paved parking area surfaces are maintained in good condition to prevent erosion and are cleaned on a routine basis using street sweepers. Minor areas where pavement may become degraded are patched. Parking lot inspections are conducted at least annually to identify degraded or stained areas, which could result in impact to storm water during the rainy seasons.

4.4.6 CONSTRUCTION AND MAINTENANCE ACTIVITIES

LBNL seeks to institute best management practices to avoid impact to the storm drain system from soil erosion or construction materials. The following BMPs have been implemented for LBNL construction and maintenance activities at the site:

- Excavation piles are covered with weighted plastic during the rainy season
- Storm drains are protected from soil or other materials by placement of a cover, filter fabric, or other diversion during construction activities
- Good housekeeping practices are implemented on each construction site
- Hazardous materials are stored in closed containers and away from storm drain locations.
- Water from saw-cutting activities is vacuumed up immediately behind the sawcutter.
- A specific location has been designated on-site for concrete washout. Residue is allowed to harden and then disposed of as trash, avoiding discharge to storm drains.
- During testing of fire hydrants and risers, or during an incident in which a sewage or water supply pipe has broken, personnel carry thiosulfate tablets and employ them to the extent possible to prevent water with chloramine from being discharged to the storm sewer system. A specific procedure, OPER-344, has been written to address the use of thiosulfate tablets.
- Specific preventive practices are expected when washing a building, removing old paint, or scraping prior to repainting. Washwater needs to be collected, filtered, and possibly tested before disposal, preferably to sanitary sewer drains. A specific procedure, OPER-345, addresses this activity.

4.5 GENERAL SITE-WIDE BMPs

General source-control BMPs that have been implemented site-wide at LBNL to reduce potential for pollutants to come into contact with storm water include housekeeping, storm drain maintenance, elimination of non-storm water discharges, and sedimentation and erosion controls.

4.5.1 HOUSEKEEPING

Inspection and cleaning of all material handling areas and areas where storm water is discharged is conducted on a routine basis. Programmatic organizations are responsible for their own areas. Litter

control, pick-up for disposition off-site, and street/sidewalk sweeping are also carried out by M&O crews routinely to reduce the potential for pollutants to enter storm water. Street/sidewalk sweeping is usually conducted prior to predicted large storms to prevent storm drains from becoming plugged with organic materials such as leaves, trash, and brush. As noted in 4.4.2, a program has been initiated which assists divisions and buildings in either eliminating unnecessary waste storage or ensuring that dumpsters and hoppers are kept covered or under shelter.

4.5.2 STORM DRAIN MAINTENANCE

Maintenance of storm water-related facilities by M&O crews is carried out on an as-needed basis. Routine and scheduled inspections, especially before the storm season begins and before and during expected major storms, provide the information to schedule preventive maintenance that is designed to ensure serviceability of the storm water system.

Preventive maintenance of storm drains so as to maintain unimpeded flow is conducted to remove materials such as trash, brush, leaves, and water-borne solids that settle out. The drains, culverts, and other flow control structures are visually inspected during maintenance activities.

The following BMPs have been implemented for LBNL storm drain maintenance at the site:

- Operations and Maintenance crews patrol the site during off-hour storms to ensure that storm drain structures remain clear of storm-induced debris, and that flow remains unimpeded
- Common hand tools, such as shovels and rakes, supported by powered equipment such as backhoes and Bobcat tractors, are available
- Other personnel on-site during off hours are also required to report LBNL storm drainage problems, should they occur
- During normal working hours, the LBNL site is highly populated and additional reports of storm-related problems may be received from any employee or guest.
- Prior to the rainy season each year, Operations and Maintenance crews clean at least 20% of the catch basins in the storm drain system. A new mechanical vacuum truck has been acquired which facilitates this work.

4.5.3 ELIMINATION OF NON-STORM WATER DISCHARGES

To comply with requirements of the State Water Resources Control Board's General Industrial Storm Water Permit, in 1991 Facilities identified all connections that routed non-storm water discharges to the storm drain system. As-built drawings were reviewed and visual inspections and fluorescent dyes were used to identify these connections. A total of 38 connections were identified and documented during this survey. In 1992, LBNL notified the Board that it could not

eliminate them prior to implementation of the SWPPP, but committed to doing so prior to the regulatory deadline of March 30, 1995.

Using the data from the 1992 survey, all 38 connections were either re-routed to the sanitary sewer, provided with secondary containment, or otherwise mitigated. The Storm Drain Corrective Action Project was completed by the regulatory deadline of March 30, 1995. The Board was notified of the elimination of all such connections by letter of March 23, 1995. All new and modified building and facilities designs are now reviewed to ensure that non-storm water connections are not specified.

A new training course and programs such as covering/sheltering of dumpsters also raise awareness of proper disposal practices and promote elimination of non-storm water discharges.

4.5.4 SEDIMENT AND EROSION PREVENTION

Standard methods of erosion control are implemented on-site. These involve landscape and soil stabilization plantings, retaining walls and directed drainage to prevent gullying, and impervious covers for unstable slopes. Where possible, native and naturalized plants are encouraged. The ABAG and Forest Practices standards for erosion control are used as necessary in the vegetation management program.

Erosion control during storms is provided by Operations and Maintenance. Examples of such emergency erosion control measures are the use of sandbags, hand tools, and earth moving equipment to maintain directed storm water flows, and plastic sheeting to protect unstable slopes.

Standard erosion control practices are also implemented at construction sites. Specifications for slope protection and erosion control, and other best management practices, are incorporated into contracts for outside contractors on larger projects.

4.6 MANAGEMENT CONTROL BMPs

LBNL's Environmental Services Group is chartered with development and implementation of policies, programs, and procedures to minimize impact of laboratory activities on human health and the environment. A wide range of programs have been developed to meet this charter; elements of some of these programs directly result in elimination of pollutants to storm waters.

Management controls implemented at LBNL include programs to conduct site-wide inspections to identify conditions that could result in pollution of storm water, and policies and procedures that delineate requirements for management of materials to minimize releases and accidents. Programs, policies, and procedures specific to activities conducted at LBNL that provide control of the sources of potential pollutants (source controls) are described in Section 4.4 of this plan. Site-wide programs, policies and procedures in place at LBNL to manage and monitor site operations with elements, which minimize

contribution of pollutants to storm water, are considered management controls and are summarized below.

4.6.1 INSPECTIONS

In accordance with the General Industrial Permit, LBNL conducts an annual facility inspection to certify that the best management practices (operating practices) incorporated in LBNL operating manuals and in this Plan are in use and are effective. Results are reported every year in the Annual Report.

The LBNL site is patrolled every shift by technicians from Operations and Maintenance. Their primary aim is to ensure that plant facilities and equipment are working properly. Any unusual occurrences are noted and reported for appropriate response. During storm events, special attention is given to storm damage and to maintaining drainage.

Walk-through inspections may be made by supervisors at any time to ensure that facilities are in good order and ready for service during storms. These inspections may also address other matters requiring compliance with best management practices or LBNL policies.

Inspections mandated under the SWMP identify conditions which could result in pollution of storm water (quarterly observations of any non-storm water discharges) and any actual conditions where storm water is being impacted, such as presence of floating or suspended materials, oil and grease, discolorations, turbidity, and odor (monthly observations during wet season). Storm water inspections are conducted and documented by personnel from the Environmental Services Group.

4.6.2 RECORDKEEPING

Records of the operations of all LBNL organizations, for the purposes of this Plan, consisting of design, required inspections, maintenance and repair, and procedural instructions are maintained in accessible form by the respective responsible departments or divisions.

The locations of the records relating to this SWPPP are listed below:

Type of Record	Maintainer of Record
Facility Inspections	Facilities Division; Operations and Maintenance
	Environment, Health, and Safety Division
Monitoring Data	Environment, Health, and Safety Division
Operational Logs	Facilities Division; Operations and Maintenance
	Environment, Health, and Safety Division

These records will be retained in accordance with regulatory and DOE recordkeeping and archival requirements.

4.6.3 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Hazardous Materials (see also Section 4.4.1). Materials management programs exist for the safe and appropriate handling of all materials used at LBNL. Specific procedures are provided for safe lifting, maintenance of packaging integrity, and proper storage. Materials are handled in a manner to ensure that they remain contained at all times and are only handled by trained personnel.

Hazardous Waste. LBNL has implemented a hazardous waste management program, which specifies procedures for handling and containment of hazardous wastes. Such wastes are collected and handled in such a way that they remain contained at all times. Therefore they are not potential contaminants of storm water runoff except in the case of accidents. The guiding documents for this program include Guidelines for Generators of Hazardous Chemical Waste at LBNL and Guidelines for Generators of Radioactive and Mixed Waste at LBNL, Guidance for WAAs, and the Part B permit for the Hazardous Waste Handling Facility.

All hazardous waste is handled by the Environment, Health, and Safety Division Waste Management Group. Waste is accumulated inside buildings in satellite accumulation areas or in waste accumulation areas (see Figure 3-1) that are maintained locally by program personnel. These WAAs are inspected at least weekly; the Hazardous Waste Handling Facility (Building 85) and FTUs are inspected daily. All inspections are documented and results reviewed.

4.6.4 WASTE MINIMIZATION

The LBNL Waste Minimization Program is carried out as an integral part of Laboratory operations. The main benefits of this program with respect to storm water protection are reduction in the quantity of potential pollutants in the waste stream resulting from operations, and systematic waste handling practices such as compaction, packaging, and transportation that preclude escape of pollutants onto the ground or into the air (where they could become mixed with storm waters).

4.6.5 RADIOACTIVE SUBSTANCES

Procedures are implemented to ensure the containment of radioactivity in suitable shielding and controlled-access enclosures, and for handling and transportation of radioactive substances. LBNL maintains air-sampling and penetrating radiation monitors at various locations around the site and at the site boundary. Additionally, effluent stacks from workplaces at LBNL are monitored for specific substances.

4.6.6 SPILL PREVENTION AND RESPONSE

The LBNL Master Emergency Plan and the LBNL Risk Management and Prevention Plan provide response procedures for hazardous releases of any nature.

Spill prevention and response to oil spills are addressed in the LBNL SPCC Plan. This SPCC Plan details the history of past spills and assesses the potential for future spills. Secondary containment requirements and design criteria are specified for aboveground and underground tanks, oil-filled electrical equipment, drum storage, and other miscellaneous containers. Operational practices such as bulk transfer are described, and inspections and preventive maintenance of facilities are in effect to prevent leakage and spillage. Supervision and training for personnel who are involved in spill prevention and cleanup are specified.

Standard practices to contain spillage from aboveground tanks, drums, and storage areas include containment structures such as berms that trap any reasonably possible leakage before it can flow into the storm drain system. Bulk storage areas are designed to minimize the possibility of leakage, and are sheltered to minimize potential impact to storm water.

4.6.7 TRAINING

All LBNL employees receive orientation and training at the time of hire, and as part of their continuing employment. It is the responsibility of supervisors to ensure that their subordinates are aware of applicable requirements and documented instructions that apply to their work.

Through various forms of outreach, for example, articles in the LBNL newspaper, or labels on storm drains, employees are made aware of the requirements for protection of the storm drain system from pollutants, and of the importance of proper disposal of waste materials. As often the first observers and responders to emergencies, they are made aware of the appropriate actions to take and how to report the emergency.

All Facilities Division personnel receive periodic training in environmental and safety issues. One form of this training is via regular safety meetings. Another form is a formal training course, Stormwater Management, which was created in 2005 in response to draft permit requirements. This is linked to the Berkeley Lab Job Hazard Questionnaire database and is a requirement for all Facilities personnel.

Special training for emergency responders is provided as described in LBNL's HMBP.

Spill Response. Training in emergency spill response, ranging from reporting and initial steps to backup and cleanup by emergency response personnel is provided as appropriate to the responsibilities of and

operations conducted by each employee. In general, emergency response is provided by the LBNL Fire Department, with backup from the Industrial Hygiene and Waste Management groups.

Storm Water Monitoring. Personnel who collect and process samples of storm water discharge receive training as specified in the Storm Water Monitoring Program.

Schedules. Training schedules for each employee, beginning at the time of hire, are formulated and maintained for each employee. The new-hire training, with respect to health and safety matters, is carried out by the Environment, Health and Safety Division.

It is the responsibility of each supervisor to know what training is required for his or her employees, and to ensure that this training has been carried out for each employee before the employee is required to perform without direct supervision. All employees will receive information on the LBNL policy for storm water pollution prevention.

4.6.8 CONSTRUCTION SPECIFICATIONS

Efforts have been made to incorporate into construction specifications protection of the storm water system from construction activities with the potential to pollute. All construction projects on the site are conducted in general accordance with the Master Specifications developed by the Facilities Division. A Division I specification on general EH&S requirements (01020) includes BMPs for construction projects. Additionally, project-specific construction specifications must include storm water BMPs required for the project. Contractors are required to adhere to LBNL storm water construction specifications, and to show evidence of a construction storm water pollution prevention plan for projects over one acre in size. See also section 5

4.6.9 POST-CONSTRUCTION CONTROLS

Post-Construction stormwater management will be incorporated into plans for new development and redevelopment. The program will, to the extent possible, incorporate into the design of projects long-term BMPs that prevent or minimize water quality impacts and seek not to increase the quantity of water discharged. These BMPs may be structural or non-structural, and will be implemented through use of written policies and specifications such as proposed site design guidelines. The strategies will reflect site conditions, receiving waters, and amount of anticipated construction. See also section 5.

5.0 SIX MINIMUM MEASURES

To comply with anticipated new requirements in the revised industrial permit, this section discusses the six minimum measures referred to in the Phase II MS4 permit. LBNL was not captured under Phase II requirements because it has a general industrial permit that applies to its whole site (refer to Item 13 of the Phase II permit). However, it is required to address the six minimum measures in this SWPPP and thereby document this for the San Francisco Bay Regional Water Quality Control Board.

The six minimum measures are as follows:

- Public Education
- Public Participation – Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

"Public" on this site is to be understood as staff, guests, and employees, not members of the general public. Below are the ways in which Berkeley Lab addresses and has incorporated, or plans to incorporate, the six minimum measures into its stormwater program.

Public Education and Outreach

- Develop training materials and provide training for employees, and their supervisors, whose job functions include the use or disposal of possible stormwater contaminants.
- Label storm drain inlets.
- Place articles in Lab View (the monthly newsletter) and Today at LBL (the daily electronic newsletter) as appropriate to raise awareness of the stormwater program.
- Upon complaints or reports of release of inappropriate materials to storm drains, contact the individuals or organizations and explain regulations and proper behavior or disposal methods.
- Provide educational materials on stormwater and staff a table at Earth Day events.
- In cooperation with UCB, publicize the Strawberry Creek website and community creek cleanups on campus.

Public Participation/Involvement

- Establish the Storm Water Working Group to review and approve the SWPPP.
- Publicize the URL and the availability of the SWPPP and the SWMP on the ESG website.
- Report on the stormwater program and monitoring data annually in the Site Environmental Report, and publicize its availability on the ESG website.
- Publicize the name, phone number, and e-mail address of the ESG stormwater program manager for reporting of stormwater pollution. Provide a link on the ESG website for e-mail reporting.

- Provide planning, design, construction, and operations recommendations to management and staff to improve quality and minimize quantity of stormwater runoff.
- Provide review services for project planning documents.
- Provide oversight and assistance to construction projects, especially those over 1 acre in size which require a separate construction permit, to ensure that they comply with regulations and prevent stormwater pollution.

Illicit Discharge Detection and Elimination

- Develop and maintain a map of the Lab's storm drainage system, showing outfall locations and the waters of the US that receive discharge from it.
- Develop a system of identification for the pipes and catch basins/inlets of the storm drainage system similar to that of the sanitary sewer system.
- Conceive and implement a program to identify and subsequently eliminate any cross-connections from the sanitary sewer system to storm drains. This program was completed in 1995, and was reported to the Regional Water Quality Control Board by letter of March 23, 1995.
- Ensure that Lab specifications and contracts prohibit design of any unauthorized non-stormwater discharges to the storm drainage system.
- Educate Lab public to prevent illegal discharges and improper disposal of waste using measures as detailed in Public Education and Outreach and Public Participation/Involvement above.
- Encourage Lab employees to be aware of dry weather flows into the storm drainage system and to report suspected unauthorized discharges.

Construction Site Runoff Control

- Develop procedures for Crafts, Laborers, and others who work outside to protect the storm drains. One existing example is Facilities Procedure OPER-345, which addresses measures to be taken for wastewater management when washing buildings. Another is Facilities Procedure OPER-344, which presents methods for the use of thiosulfate tablets to neutralize chloramine in drinking water to be discharged to the storm drainage system.
- Forward e-mail storm advisories to appropriate personnel (project managers, inspectors, contractors, and Operations and Maintenance management) to advise them of impending storms and enable them to prepare their sites and institute stormwater pollution prevention controls.
- Develop a construction specification requiring the implementation of proper erosion and sediment controls, and appropriate BMPs, for all construction sites, to prevent the discharge of contaminants to storm drains. Ensure that this specification is inserted into appropriate contracts, and that contractors and subcontractors are trained on requirements. A section addressing construction stormwater management can be found in the Master Specification which contains general EH&S requirements, Div. 1, 01020.
- Develop and implement Facilities Division procedures or memoranda of understanding which require EH&S review of construction plans to consider potential water quality impacts.

- Develop and implement Facilities Division procedures for site inspection and enforcement of control measures to prevent the discharge of contaminants to storm drains.
- Train project managers and site inspectors on appropriate BMPs for construction sites (primarily using the California Stormwater Construction Handbook published by the California Stormwater Quality Association).
- Develop a mechanism to ensure that projects exceeding one acre will apply for and comply with a separate Construction Stormwater Permit.

Post-Construction Runoff Control

- A third-party review of the SWPPP was commissioned by Facilities in 2005 with a view toward ensuring completeness of the SWPPP and compliance with permit regulations. Further review and evaluation will be undertaken to identify post-construction control measures that are appropriate for the steep Lab site.
- Develop standard specifications for appropriate post-construction structural and non-structural BMPs and ensure their incorporation into contracts.
- Develop Lab design guidelines and incorporate appropriate structural and non-structural design strategies into them.
- Formalize in the LRDP and/or design guidelines the Lab policy of not building in or near any creeks.
- Provide assistance by Stormwater Program personnel to project planners, managers, and architects in identifying and selecting appropriate post-construction controls. Evaluate each project on its own merits in order to decide which post-construction controls are appropriate.
- Project review (see Public Participation/Involvement) will ensure that BMPs are incorporated into design.
- Develop and implement policies and procedures to ensure long-term operation and maintenance of relevant controls.

Pollution Prevention/Good Housekeeping

- Develop and implement an operations and maintenance inspection program to prevent/reduce runoff from operations to storm drains.
- Train employees on stormwater management and water quality issues, in particular those employees involved in fleet and building maintenance, construction, design, grounds maintenance, custodians, cafeteria workers, and the Fire Department.
- Assist Operations and Maintenance personnel in defining appropriate maintenance activities, schedules, and inspection procedures.
- Promote proper waste disposal and use of site waste collection and transport methods.
- Actively publicize prohibition on disposal of hazardous materials to dumpsters, and policy of keeping dumpsters closed and/or sheltered. Work with buildings/divisions to find covered space for dumpsters and hoppers to the extent possible.

- Emphasize housekeeping and proper practices in such areas as spill control, vehicle washing, fueling, vehicle maintenance, and catch basin cleaning. Ensure that site cleaning is done by sweeping, not hosing down, areas. Mechanical sweepers and a vacuum extraction truck have been purchased to facilitate these activities.
- Train landscape and grounds management personnel to minimize use of pesticides and use of water for irrigation purposes. Encourage implementation of Integrated Pest Management methods.
- Train appropriate personnel to minimize use of domestic drinking water that needs to be discharged to storm drains, and to implement procedures for use of thiosulfate tablets when necessary for such activities as hydrant flushing, emergency eyewash/shower testing, and firefighting training activities.

6.0 GENERAL REQUIREMENTS

This SWPPP is a public document as required under Section 308(b) of the CWA and, as such, is available for inspection by, but need not be submitted to, regulatory agencies. LBNL will make this document available to the Regional Water Quality Control Board and City of Berkeley, if requested, to determine compliance with this General Industrial Permit, and will also make available any records that are required by the General Industrial Permit.

This SWPPP will be amended as appropriate, according to guidelines given in the General Industrial Permit.

7.0 REFERENCES

7.1 GENERAL OPERATIONAL GUIDANCE

Activity Hazard Documents. Specify facility-specific procedures to ensure safety of operations. Issued for LBNL facilities by Environment, Health, and Safety Division.

Emergency Plans (Provided for each building)

Health and Safety Manual, Lawrence Berkeley Laboratory Report Pub-3000 (Rev. December 1999). Revised as necessary.

Regulations and Procedures Manual, Lawrence Berkeley Laboratory Report Pub-210 (Rev. July 2001). Revised as necessary.

Water Quality Control Plan (Basin Plan), California Regional Water Quality Control Board, San Francisco Bay Region (June 1995).

7.2 SPECIFIC OPERATIONAL GUIDANCE AND DATA

Alameda Countywide NPDES Municipal Stormwater Permit, Order R2-2003-0021, NPDES Permit No. CAS0029831, California Regional Water Quality Control Board, San Francisco Bay Region, 2003.

Annual Site Environmental Report of the Lawrence Berkeley Laboratory, Lawrence Berkeley Report LBNL-27170 (issued annually).

Stormwater Best Management Practice Handbook; Construction, California Stormwater Quality Association, January 2003

Chemical Hygiene and Safety Plan for Laboratories, Lawrence Berkeley Laboratory Report Pub-5341 (Web-based, revised as appropriate).

General Industrial Storm Water Permit, State Water Resources Control Board (May 1, 1997).

Geology of Lawrence Berkeley Laboratory (September 1982).

Groundwater Protection Management Program, Lawrence Berkeley Laboratory (January 1995).

Guidelines for Generators of Hazardous Chemical Waste at LBNL to Meet HWHF Acceptance Requirements for Hazardous, Radioactive, and Mixed Wastes at LBNL, Lawrence Berkeley Laboratory Report Pub-3092 (September 1999).

Guidelines for Waste Accumulation Areas (WAAs), Lawrence Berkeley Laboratory Report Pub-3093 (March 1998).

Hazardous Materials Business Plan, Lawrence Berkeley Laboratory Report Pub-836, (March 2002, revised annually).

Hazardous Waste Treatment and Storage Permit Application for the Lawrence Berkeley Laboratory Hazardous Waste Handling Facility, Parts A and B (Rev. July 2001).

LBNL Spill Prevention Control and Countermeasure Plan (SPCC) (March 2002).

LBNL Environmental Monitoring Plan (2005).

Master Specifications for Construction Projects, LBNL Facilities Division.

Storm Drainage Study: Strawberry Creek Watershed at University of California, Lawrence Berkeley Laboratory (February 1980)

Storm Drainage Study of Eastern Portion of the Strawberry Creek Watershed at University of California, Lawrence Berkeley National Laboratory, G.T. Kuntz, Consulting Engineer, October, 2004.

Storm Water Monitoring Program, Lawrence Berkeley National Laboratory (December 2001).

Waste Minimization Program, available on LBNL Website at http://www.lbl.gov/ehs/wastemin/