



Environmental Functional Area

Water, Air, Monitoring & Analysis

UCRL-AR-126783-12

**Lawrence Livermore National Laboratory
Livermore Site
Annual Storm Water Monitoring Report for
Waste Discharge Requirements 95-174**

**Annual Report
2011–2012**

August 2012

Michael A. Revelli



**Lawrence Livermore
National Laboratory**

**This work performed under the auspices of the U.S. Department of Energy by
Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.**

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

**Lawrence Livermore National Laboratory
Livermore Site Annual Storm Water
Monitoring Report
for Waste Discharge Requirements 95-174**

Reporting Period May 1, 2011 through April 30, 2012

REGIONAL BOARD INFORMATION

Contact Person:
Bruce Wolfe

Address:
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

GENERAL INFORMATION

A. *NPDES No:*
CA0030023

B. *Operator:*
LLNS

Contact Person:
Frances Alston
Lawrence Livermore National Laboratory
P.O. Box 808, L-510
Livermore, CA 94551
(925) 422-3343

C. *Facility/Site:*
Livermore Site

Contact Person:
Bruce Schultz
Lawrence Livermore National Laboratory
P.O. Box 808, L-626
Livermore, CA 94551
(925) 423-3978

Facility SIC Codes:
SIC Code 8733 Non-Commercial Research Organizations
SIC Code 9711 National Security

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

CONTENTS

	Page
Acronyms and Definitions.....	iv
EXECUTIVE SUMMARY	Summ-1
1.0 Introduction	1
2.0 Nonstorm Water Discharges.....	2
3.0 Annual Site Inspections	3
4.0 Visual Observations.....	3
5.0 Storm Water Sampling and Analysis.....	4
5.1 Toxicity Monitoring	6
5.2 Nonradioactive Parameters.....	7
5.3 Radioactive Parameters	9
6.0 Summary and Conclusions	9
7.0 References	11
Acknowledgments	12

FIGURE

Figure 1. Routine storm water sampling and observation locations.....	2
---	---

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

TABLES

Table 1.	Monthly rainfall totals (inches) collected at the LLNL site meteorological station... 1
Table 2.	Livermore site-specific threshold comparison criteria for selected water quality parameters for storm water runoff. 6
Table 3a.	Single point acute fish toxicity test results for October 6, 2011, at WPDC. 7
Table 3b.	Chronic fish toxicity test results for October 6, 2011, at WPDC 7
Table 4.	Constituents in storm water greater than the LLNL-specific threshold comparison criteria 8

APPENDIX A TABLES

Table A-1.	May 2011–April 2012 – Summary of nonroutine releases, Livermore Site. A-1-1
Table A-2.	Summary of best management practice inspections in potential pollutant source/industrial activity areas. A-2-1
Table A-3.	Record of dry season visual observations..... A-3-1
Table A-4.	Record of wet season visual observations. A-4-1
Table A-5.	October 2011–April 2012 daily rainfall totals (for days with >0.2 inches precipitation), Livermore Site..... A-5-1
Table A-6.	Storm water quality data for October 6, 2011 A-6-1

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Acronyms and Definitions

ALP	Arroyo Las Positas
ALPE	Arroyo Las Positas East (storm water influent sampling location)
ALPO	Arroyo Las Positas Outfall (storm water influent sampling location)
ASS2	Arroyo Seco South (storm water influent sampling location)
ASW	Arroyo Seco West (storm water effluent sampling location)
AWQC	ambient water quality criteria
B	building
BMP	best management practice
Bq/L	becquerel/liter
CA	California
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
COD	chemical oxygen demand
DI	deionized
DO	dissolved oxygen
DOE	Department of Energy
DRB	Drainage Retention Basin, renamed Lake Haussmann
ERD	(LLNL) Environmental Restoration Department
gpm	gallons per minute
GRNE	Greenville Road East (storm water influent sampling location)
HMMA	Hazardous Materials Management Area
hr	hour
LCW	low conductivity water
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security, LLC
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/L	milligrams per liter
MUSD	Maintenance and Utilities Services Department
N/A	not analyzed
NOEC	no observed effects concentration
NPDES	National Pollutant Discharge Elimination System
O&G	oil and grease
pCi	picocurie
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
ppb	parts per billion
PVC	polyvinyl chloride
PTU	portable treatment unit
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act of 1976
RHWM	Radioactive and Hazardous Waste Management

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Acronyms and Definitions (Continued)

SC	specific conductance
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SI	system internationale
SM	standard method
SWPPP	Storm Water Pollution Prevention Plan
T	trailer
TCE	trichloroethene (or trichloroethylene)
TDS	total dissolved solids
TF	treatment facility
TOC	total organic carbon
TSS	total suspended solids
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound
WAA	waste accumulation area
WDR	Waste Discharge Requirements
WPDC	West Perimeter Drainage Channel (storm water effluent sampling location)

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

EXECUTIVE SUMMARY

Results of the storm water quality monitoring program at Lawrence Livermore National Laboratory (LLNL) in Livermore, California are reported as required in the Waste Discharge Requirements (WDR) 95-174, National Pollutant Discharge Elimination System (NPDES) Permit No. CA0030023. This report presents results for the 2011–2012 water year including: the Storm Water Pollution Prevention Plan (SWPPP) facility inspection results, wet and dry season observations, storm water discharge analytical data, and a summary interpretation of the data.

The facility inspection results indicated a few minor instances at the Livermore site in which best management practices (BMPs) listed in the SWPPP were not properly implemented, but that corrective actions have either been made or are in progress. Other than minor debris accumulation (primarily leaves and sticks) at some sampling locations, storm water observations did not identify any pollutants. Due to the timing and duration of rainfall events during this wet season, only one qualifying storm event (October 6, 2011) occurred during normal business hours at the LLNL Livermore site. Acute and chronic fish toxicity testing indicated no toxicity in effluent storm water samples. Although there are no numeric effluent limits placed on storm water discharges, data are compared with various criteria to determine if water quality remains similar to natural or upstream conditions, or that concentrations are below levels of concern. Water samples showed nine influent constituents (total suspended solids, pH, beryllium, copper, lead, mercury, zinc, gross alpha, and gross beta) but only three effluent constituents (total suspended solids, gross alpha, and gross beta) above LLNL site-specific threshold comparison criteria; however, all of the data exceeding LLNL thresholds during 2011–2012 are attributed to off-site activities upstream of the Laboratory. All other effluent monitoring results were less than comparison criteria. These results indicate that LLNL's current BMPs are effective and that operations at the LLNL Livermore site during 2011–2012 did not impact storm water quality.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

1.0 Introduction

This report discusses the results of the 2011–2012 Livermore site storm water monitoring program. Storm water quality monitoring results for the LLNL Livermore site are summarized, fulfilling the annual reporting requirements of WDR 95-174, issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) on August 23, 1995, (hereafter referred to as “the Permit”). The Permit expired on August 23, 2000. LLNL submitted a Report of Waste Discharge (and an NPDES permit application) to renew the Permit on February 18, 2000, meeting the requirement to submit a renewal application 180 days in advance of permit expiration. SFBRWQCB staff confirmed the administrative continuance in November 2000 (Morse 2000).

The Livermore site is a 3.28-km² facility that is crossed by two intermittent streams, Arroyo Las Positas and Arroyo Seco. The average annual rainfall at the Livermore site is 13.7 inches (34.8 cm), and the rainfall for the 2011–2012 reporting period was 9.07 inches (23.04 cm). Monthly rainfall totals are presented in **Table 1**. LLNL monitors influent and effluent water quality as required by the Permit. The six perimeter storm water sampling locations are shown in **Figure 1**, along with three internal (on-site) monitoring locations around the drainage retention basin, renamed Lake Haussmann.

Table 1. Monthly rainfall totals (in inches) collected at the LLNL site meteorological station.

Date	Monthly Total (inches)
May 2011	0.33
June 2011	0.95
July 2011	0.00
August 2011	0.00
September 2011	0.01
October 2011	1.16
November 2011	0.77
December 2011	0.03
January 2012	1.26
February 2012	0.49
March 2012	2.15
April 2012	1.92
Water Year TOTAL	9.07

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

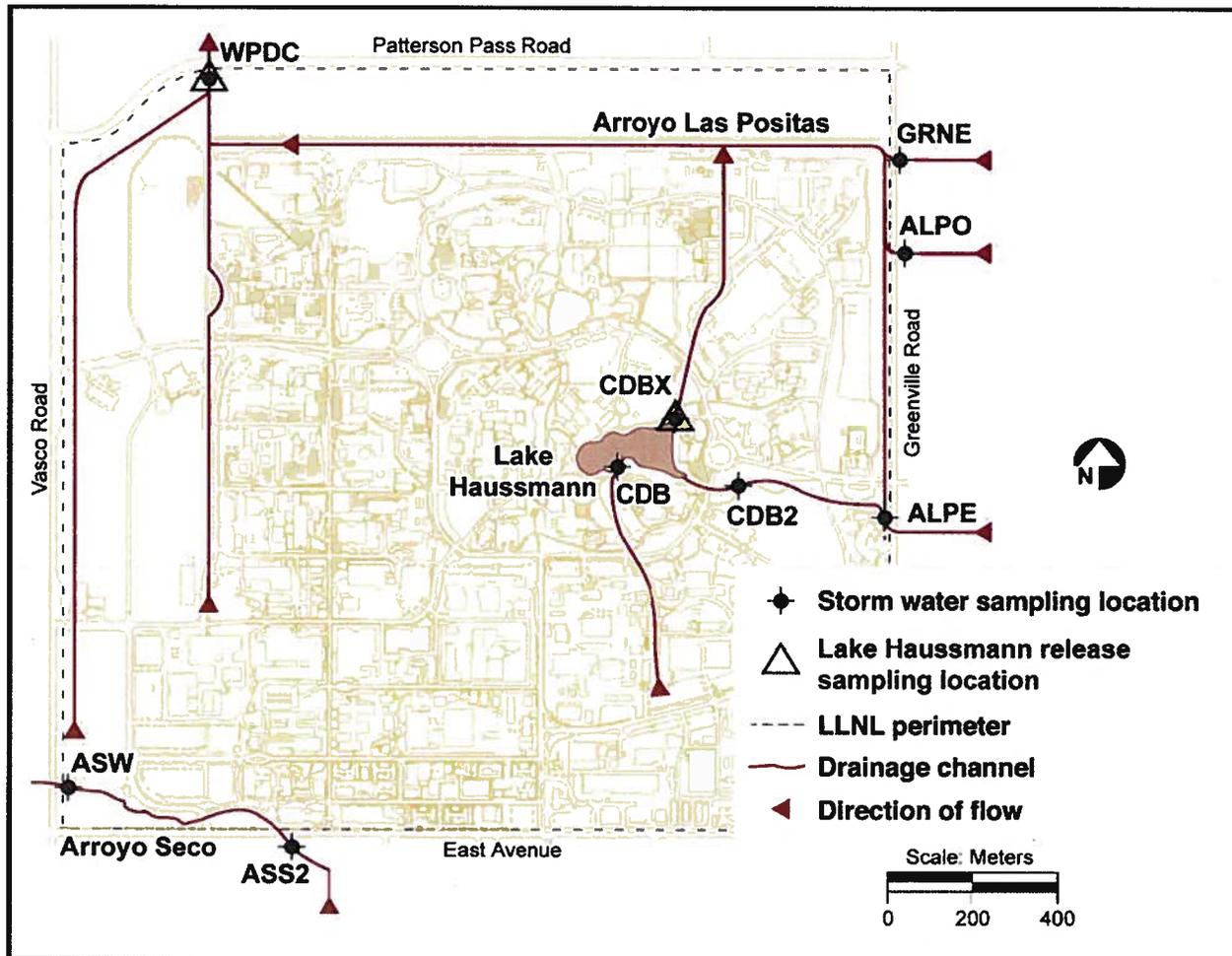


Figure 1. Routine storm water sampling and observation locations.

2.0 Nonstorm Water Discharges

The SFBRWQCB issued the Permit to LLNL, allowing storm water discharges associated with industrial activities and four categories of nonstorm water discharges, including mechanical equipment sources (e.g., air conditioners), building and grounds maintenance (e.g., landscape irrigation), fire suppression and safety systems (e.g., hydrant testing), and water systems (e.g., backflow preventors). In addition, the Permit allows LLNL to administratively control several building conduits that remain open because they are impractical to seal.

LLNL tracks authorized nonstorm water discharge sources through the Building Drain Management database and key plans, and an internal drain connection permitting process. As required by the Permit, Provision C.8, LLNL evaluates all new construction, remodeling, and equipment upgrades to determine if it is practical to eliminate permitted discharge sources. If it is practical to do so, the discharge is eliminated. Modifications that result in new connections to building conduits are added to the Building Drain Management database.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Authorized nonstorm water discharge sources and open building conduits are included in LLNL's Dry Season Observation Program. These observations help LLNL verify that the BMPs applied to these discharge sources continue to be properly implemented. Areas in the Dry Season Observation Program include secondary containment areas, loading and receiving areas, floor drains open to the storm drainage system, and automatic sump pumps. These locations and observation results are discussed in detail in this report in Section 4.0, Visual Observations. Nonroutine releases are summarized in **Appendix A, Table A-1**. This table includes unplanned releases reportable under the Permit, Provision C.1, and nonroutine releases allowed under the Permit but requiring prior notification under Provision C.7.

3.0 Annual Site Inspections

Each of the Principal Directorates (LLNL's high level organizational unit) at LLNL conducts an annual inspection of its facilities to verify implementation of the SWPPP and ensures that measures to reduce pollutant loading to storm water runoff are adequately and properly implemented. The Principal Associate Directors for each of the Principal Directorates certify that their facilities comply with the provisions of the Permit and the SWPPP. Each Principal Directorate documents and keeps on file the annual inspection results (as required by the Permit). These records include the dates, places, and times of the site inspections and the names of individuals performing the inspections. Because of the large number of facilities inspected (more than 500 buildings and trailers), the detailed inspection results are not included in this report, but the individual inspection records are available for submittal or review upon request. All inspections were completed; findings and deficiencies are summarized in **Appendix A, Table A-2**.

A few inspections noted inconsistent or incomplete implementation of BMPs in the annual SWPPP inspections. All of these issues have either been corrected or are in the process of being corrected as described in **Appendix A, Table A-2**. All other inspections indicated that the applicable BMPs were implemented correctly and adequately.

4.0 Visual Observations

Dry season observations were performed and are provided in **Appendix A, Table A-3**. The Permit requires that observations be conducted at least twice during the dry season (May through September). These observations occurred on June 27 and September 21, 2011, at storm water effluent sampling locations (**Figure 1**, Arroyo Seco West [ASW] and West Perimeter Drainage Channel [WPDC]), at storm water influent sampling locations (**Figure 1**, Arroyo Seco South [ASS2], Arroyo Las Positas East [ALPE], Arroyo Las Positas Outfall [ALPO], and Greenville Road East [GRNE]), at areas with a "high potential" of storm water pollution, and at nonstorm water discharge locations to determine the presence of stains, sludges, odors, and other anomalous conditions. "High potential" areas include areas with automatic (e.g., sump pumps) or direct connections to the surface and areas where activities may result in accidental releases to the surface (e.g., loading/receiving areas and open rinse areas).

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

To determine the "high potential" areas, LLNL compiled and categorized potential storm water pollution areas, using information from the following sources:

- *LLNL Livermore Site Annual Storm Water Monitoring Report* (Brandstetter 1994);
- LLNL's Building Drain Management Database;
- LLNL's *Report of Waste Discharges*, March 1995 (Mathews and Welsh 1995); and
- LLNL's Observation Records.

LLNL then conducted inspections, visual observations, and assessments of these potential areas for storm water pollution. Areas determined as "high potential" are included in the dry season observation program as follows:

- Arroyo Seco and Arroyo Las Positas (observations conducted at influent and effluent locations);
- Avenue K storm drain;
- Automatic sump pump area at Building 191;
- Loading/receiving areas in Buildings 194 and 341;
- Concrete wash area near Parking Lot F-2; and
- Floor drain areas open to the environment in Buildings 111, 194, 391, and 551.

During this reporting period, the dry season observations did not identify any unusual discharges. Observed evidence of flow at some locations was from discharges of treated groundwater allowed under the *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision* (US Department of Energy 1992). All indications of nonstorm water flows were attributable to permitted discharges or natural sources.

Wet season observations are summarized in **Appendix A, Table A-4**. The Permit requires that wet season observations be conducted monthly during the wet season (October 2011 through April 2012) when significant storm events occur (a significant storm is defined as runoff lasting more than one hour). These observations are conducted at storm water influent and effluent sampling locations. Observations often indicated turbidity at both influent and effluent locations, but no unusual conditions or anomalies were observed. Due to the timing and duration of rainfall events during this wet season, only one qualifying storm event (October 6, 2011) occurred during normal business hours at the LLNL Livermore site. Storm event observations were recorded during this October 2011 storm, and during non-qualifying storms in January and April 2012. Wet season observations were also conducted during the months of November and December 2011, and February and March 2012; however, these observations did not coincide with a storm event.

5.0 Storm Water Sampling and Analysis

The Permit requires collection of two samples each wet season at effluent locations ASW and WPDC and at influent locations ALPE, ALPO, ASS2, and GRNE. However, as noted above, there was only one qualifying storm event (October 6, 2011) that generated runoff at the LLNL site to be sampled during the 2011-2012 wet season. Qualifying storms must generate runoff during LLNL Main Site working hours (Monday thru Friday between 8:00 am and 4:45 pm) and be separated from other runoff events by at least 3 working days. Runoff at the Main Site is typically associated

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

with ≥ 0.25 inches of rainfall in a 24-hour period. No second qualifying storm event generating runoff occurred during the wet season that was separated from other runoff by at least 3 working days and that generated runoff during working hours. **Appendix A, Table A-5** lists the dates and rainfall totals for all 2011–2012 wet season events that generated ≥ 0.20 inches of precipitation, as measured at the Main Site weather station, and a description of the rainfall event.

Permit-driven storm water samples were collected on October 6, 2011; however, there was insufficient runoff at one influent location (ALPO) to sample during this storm. Samples were collected as soon as possible after runoff began (most within the first hour). Water quality data from these storm water samples for the 2011–2012 reporting period are presented in **Appendix A, Table A-6**. Quality assurance and quality control (QA/QC) checks are performed on all sampling and analysis from LLNL. All data analysis included standard QA/QC practices. LLNL reports on QA annually in the Site Annual Environmental Report (Jones et al. 2011); this information is available upon request.

The Permit currently does not contain numeric limits for storm water effluent. Therefore, site-specific comparison criteria were developed from historical data to identify out-of-the-ordinary data values (**Table 2**). These criteria are used to identify data values that require further investigation and explanation. In addition to the Livermore site-specific comparison criteria, storm water results are compared to other published values, including: United States Environmental Protection Agency (U.S. EPA) benchmarks; *The Water Quality Control Plan, San Francisco Bay Basin (Region 2)* (Basin Plan) (SFBRWQCB 1995); US EPA and State maximum contaminant levels (MCLs) and Ambient Water Quality Criteria (AWQC). Although these latter criteria were established for other regulatory programs, use of a broad range of criteria can help LLNL evaluate the quality of Livermore site storm water effluent and determine the adequacy of BMPs. If a measured concentration is found to be higher than the comparison criteria, but the value is the same or higher at the influent location, the source is assumed to be unrelated to Livermore site operations; therefore, further analysis is not warranted.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table 2. Livermore site-specific threshold comparison criteria for selected water quality parameters for storm water runoff.

Parameter	Comparison criteria
Total suspended solids (TSS)	750 mg/L ^a
Chemical oxygen demand (COD)	200 mg/L ^a
pH	<6.0, >8.5 ^a
Nitrate (as NO ₃)	10 mg/L ^a
Ortho-phosphate	2.5 mg/L ^a
Beryllium	1.6 µg/L ^a
Chromium(VI)	15 µg/L ^a
Copper	36 µg/L ^a
Lead	15 µg/L ^b
Mercury	Above RL ^c
Zinc	350 µg/L ^a
Diuron	14 µg/L ^a
Oil and grease	9 mg/L ^a
Tritium	36 Bq/L ^a
Gross alpha	0.34 Bq/L ^a
Gross beta	0.48 Bq/L ^a

Note: The sources of values above these are examined to determine if any action is necessary.

^a Site-specific value calculated from historical data and studies. These values are lower than the MCLs and EPA benchmarks except for zinc, total suspended solids (TSS), and chemical oxygen demand (COD).

^b California and EPA drinking water action level

^c RL = reporting limit = 0.0002 mg/L for mercury

5.1 Toxicity Monitoring

As required by the Permit, grab samples were collected from the site storm water effluent location, WPDC, and analyzed for acute and chronic toxicity using fathead minnows (*Pimephales promelas*) as the test species. These tests are required only at effluent location WPDC and are not conducted with water from corresponding influent locations. The testing laboratory provides water for the control sample, which consists of EPA synthetic moderately-hard water.

In the acute test, 96-hour survival is observed in undiluted storm water collected from location WPDC. The Permit states that an acceptable survival rate is 20 percent lower than a control sample. If the acute toxicity test is failed, the Permit requires LLNL to conduct toxicity testing during the next significant storm event. After failing two consecutive tests, LLNL must perform a toxicity reduction evaluation to identify the source of the toxicity. The 96-hour acute toxicity test results from the October 6, 2011 sample collected at WPDC (100 percent survival, compared to 100 percent survival in the laboratory control sample) show that this water was not acutely toxic to fathead minnow survival (**Table 3a**).

The 7-day chronic fish toxicity test compared the survival and growth of fathead minnows in the storm water sample (again collected at WPDC on October 6, 2011) to the survival and growth of

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

the minnows in a laboratory control sample water. The test results are summarized in **Table 3b**. The analytical laboratory reported no statistically significant differences for either end point, and the no observed effect concentrations (NOECs) for both survival and growth were determined to be 100 percent. These results demonstrate that there was no observed toxicity in LLNL storm water effluent.

Table 3a. Single point acute fish toxicity test results for October 6, 2011, at WPDC.

Location	Sample	% Survival		
		Replicate A	Replicate B	Mean
Laboratory Control	EPA synthetic “moderately hard” water	100	100	100
WPDC	Site Effluent	100	100	100

Table 3b. Chronic fish toxicity test results for October 6, 2011, at WPDC.

Sample Concentration (%)	7-day survival Avg. (%)	7-day weight ^a Avg. (mg)
100% Laboratory Control	97.5	0.763
100% WPDC Site Effluent	87.5	0.731

^a Average weight of the fathead minnows at the end of the 7-day toxicity test.

5.2 Nonradioactive Parameters

Table 4 lists the constituents in the October 6, 2011 storm water samples that exceeded the threshold comparison criteria in **Table 2** (full results are in **Appendix A, Table A-6**); however, all of the data exceeding LLNL thresholds are attributed to off-site activities upstream of the Laboratory. Upstream activities near the Livermore site on the Arroyo Seco and Arroyo Las Positas include another scientific research institution, grape vineyards, an electrical transfer station, and cattle ranching; these activities are potential sources for the constituents shown in **Table 4**.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table 4. Constituents in storm water greater than the LLNL-specific threshold comparison criteria.

Constituent	Date	Location	Influent or Effluent	Result	LLNL Threshold Criteria
TSS	10/6/11	GRNE	Influent	2600 mg/L	750 mg/L
	10/6/11	WPDC	Effluent	960 mg/L	750 mg/L
pH	10/6/11	GRNE	Influent	8.58	<6.0, >8.5
				(pH Units)	(pH Units)
Beryllium	10/6/11	GRNE	Influent	3.3 µg/L	1.6 µg/L
Copper	10/6/11	GRNE	Influent	160 µg/L	36 µg/L
Lead	10/6/11	GRNE	Influent	91 µg/L	15 µg/L
Mercury	10/6/11	GRNE	Influent	0.45 µg/L	0.2 µg/L
Zinc	10/6/11	GRNE	Influent	460 µg/L	350 µg/L
Gross Alpha	10/6/11	GRNE	Influent	2.9 Bq/L	0.34 Bq/L
	10/6/11	WPDC	Effluent	0.67 Bq/L	0.34 Bq/L
Gross Beta	10/6/11	GRNE	Influent	3.1 Bq/L	0.48 Bq/L
	10/6/11	WPDC	Effluent	0.94 Bq/L	0.48 Bq/L

Several metals (beryllium, copper, lead, mercury, and zinc) were detected at concentrations above their respective threshold comparison criteria in the October 6, 2011 storm water sample collected at influent location GRNE. Because GRNE is an influent location, these results are attributed to off-site activities and are not related to LLNL operations. Concentrations of these metals (See **Appendix A-Table A.6**), in samples collected during the same storm at the down-gradient, LLNL effluent location (WPDC), were either non-detect (beryllium and mercury) or less than two-thirds (copper, lead, zinc) of site-specific comparison criteria. Similarly, an elevated pH value (8.58, slightly above the 8.5 threshold comparison criteria) was reported for the influent sample collected at GRNE; however, the pH reported for the effluent sample collected at WPDC was 7.66 (within the acceptable comparison criteria range of 6.0–8.5).

Two TSS values were found to exceed the LLNL-site specific comparison criteria of 750 mg/L. The first, 2600 mg/L, occurred at GRNE; an influent location, thus originates off-site and is unrelated to LLNL operations. Furthermore, this TSS concentration at GRNE can explain the second exceedance, a slightly elevated TSS value (910 mg/L) reported for downstream effluent location, WPDC. This elevated TSS at GRNE is also the likely explanation for the elevated metal concentrations in this water sample. These metals may exist in both the dissolved and particulate portions of the storm water runoff and the analytical results are reported for total metals in the water sample. Again, given that GRNE is an influent sampling location the TSS and metals results appear to be unrelated to LLNL operations.

As in past years, bromacil and glyphosate (both widely used herbicides) were detected in storm water samples. Concentrations of bromacil at influent locations ranged from <0.5 µg/L to 5 µg/L, but bromacil was not detected (<0.5 µg/L) in effluent samples at WPDC and ASW. Similarly, concentrations of glyphosate at influent locations ranged from 26 µg/L to 97 µg/L; the maximum

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

concentrations reported in effluent samples were <25 µg/L at WPDC and 34 µg/L at ASW. (See **Appendix A, Table A-6**).

One unusual compound, pentachlorophenol (PCP), had been identified at low levels in several samples collected during the 2007–2008 and 2008–2009 storm years. However, this year as in the 2009–2010 and 2010–2011 storm years, PCP was not detected at any influent or effluent sampling location. Since 1987, most of the PCP used in the U.S. has been restricted to the treatment (as a wood preservative) of utility poles and railroad ties.

5.3 Radioactive Parameters

Environmental measurements are reported in *Système Internationale* (SI) units. The SI unit for radioactivity is the becquerel (Bq), equal to 1 nuclear disintegration per second. The more commonly used unit, picocurie (pCi), is equal to 1 nuclear disintegration per 27 seconds. Results for tritium, gross alpha, and gross beta activities from storm water samples collected during 2011–2012 are included in **Appendix A, Table A-6**. The gross alpha and gross beta measurements of radioactivity were above their LLNL specific comparison criteria (0.34 Bq/L and 0.48 Bq/L, respectively) at both the GRNE and WPDC locations (**Table 4**). Given that the gross alpha and gross beta results at the influent location GRNE, upstream of LLNL activities, are a factor of three to four times the corresponding radioactivity values reported for the downstream effluent location WPDC, these results appear to be unrelated to LLNL operations. All other results for gross alpha, gross beta, and tritium activities were less than their respective comparison criteria (**Table 2**).

LLNL began analyzing storm water for plutonium in runoff in 1998. Samples were analyzed from the Arroyo Seco and Arroyo Las Positas effluent locations (ASW and WPDC). The plutonium activities measured in samples from ASW and WPDC on October 6, 2011 were below the detection limit (0.0037 Bq/L, or 0.100 pCi/L). (See **Appendix A, Table A-6**)

6.0 Summary and Conclusions

The storm water monitoring program at LLNL goes beyond the requirements of the Permit by sampling at more locations and for more parameters than the Permit requires. This additional monitoring is called for under the environmental monitoring requirements of various Department of Energy (DOE) Orders. Furthermore, LLNL investigates water quality parameters that are found to be above historic levels as demonstrated by the site-specific comparison criteria in **Table 2**.

Storm water observations were performed monthly during the wet season and quarterly during the dry season, with no major deficiencies noted. Inspections of BMPs listed in the SWPPP revealed some areas for improvement, for which corrective actions have either been made or are in progress.

Storm water samples showed nine influent constituents (total suspended solids, pH, beryllium, copper, lead, mercury, zinc, gross alpha, and gross beta) but only three effluent constituents (total suspended solids, gross alpha, and gross beta) above LLNL site-specific threshold comparison

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

criteria; however, all of the data exceeding LLNL thresholds during 2011–2012 are attributed to off-site activities upstream of the Laboratory. In addition, acute and chronic fish toxicity testing indicated no toxicity in storm water runoff samples, and all other effluent monitoring results were less than comparison criteria. These monitoring results indicate that LLNL's current BMPs are effective and that operations at the LLNL Livermore site during 2011–2012 did not impact storm water quality.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

7.0 References

- Brandstetter, E. (1994), *Lawrence Livermore National Laboratory Annual Industrial Activity Storm Water Monitoring Report* (Site No. 2 01S004546), Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AR-126783-94).
- Jones, Henry, et al. (2011), *Environmental Report 2010*, Lawrence Livermore National Laboratory, Livermore CA (UCRL-50027-10).
- Mathews, S. and R.L. Welsh (1995), *Report of Waste Discharges (National Pollutant Discharge Elimination System Application) for Lawrence Livermore National Laboratory Livermore Site Nonstorm Water Discharges*, Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AR-120460).
- Morse, S.F., to D. Fisher (2000), Letter re: *Renewal of National Pollutant Discharge Elimination System Permit No. CA 0030023 Lawrence Livermore National laboratory* (File No. 2199.9026 CIC November 8, 2001).
- SFBRWQCB (1995), *Waste Discharge Requirements and National Pollutant Discharge Elimination System Storm Water Permit for: U.S. Department of Energy and Lawrence Livermore National Laboratory*, State of California, Oakland, CA (Order No. 95-174, NPDES No. CA0030023).
- SFBRWQCB (1995), *Water Quality Control Plan, San Francisco Bay Basin (Region 2) Basin Plan*, San Francisco Bay Regional Water Quality Control Board, Oakland, CA.
- U.S. Department of Energy (1992), Record of Decision for *the Lawrence Livermore National Laboratory Livermore Site*, US Department of Energy, Washington, DC (UCRL-AR-109105).

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Acknowledgments

This report summarizes the work of many people and the author wishes to thank those who have contributed:

Karl Brunckhorst and Crystal Rosene	Sample collection, field inspections, and nonroutine release tracking.
Don MacQueen and Kim Swanson	Database management and data table generation.
Chris Campbell, Karen Folks, and Gretchen Gallegos	Permitting issues and general assistance.
Rosanne Depue	Document preparation and distribution.
Bob Williams, Henry Jones, and Nick Bertoldo	Field work and sample collection.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

APPENDIX A TABLES

Tables A-1 through A-6

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
5/9/11	B-140	About a half-gallon of diesel leaked out of a rented man-lift onto asphalt along the north side of B-140. When the leak was noticed, the man-lift was immediately turned off and absorbent was used to clean up the spill. The spilled material did not reach the storm drainage system.
5/10/11	B-111	A crack in a two-inch irrigation line on the northeast side of B-111 resulted in an estimated 850 gallons of potable water being discharged to ground during the 10-15 minutes it took to secure the line. Water flowed across a paved area and into several catch basins of the Livermore Site storm drain system. Because the discharge mostly flowed in paved areas, there was no potential for erosion and it is expected that any residual chlorine in the discharge would be unlikely to impact the dry streambed of the Arroyo Seco. Although not all of the streambed could be observed, there was no evidence that water reached the Arroyo Seco. Staff did confirm that there was no discharge from the LLNL site.
5/16/11	PTU-10	Approximately one cup of hydraulic fluid was released onto asphalt from a vehicle lift gate. Absorbent material was placed on the released fluid and a drip pan was placed under the vehicle to contain a slow, intermittent drip. The area was cleaned the following day and no fluid reached the surrounding soil.
5/17/11	B-319	Water from a fire sprinkler line flooded an office on the first floor of B-319. It is thought that the sprinkler was activated by a steam release from a nearby room radiator. Approximately 100 gallons of potable water soaked into the carpet and under the floor. The room was unoccupied and did not contain chemicals. The Fire Department responded and vacuumed up water from the carpet. The water was discharged to the lawn and shrubbery.
5/21/11	B-321A	Approximately 50 gallons of dilute coolant (95% DI water, 5% Blaser Swisslube) overflowed from a coolant cart in B-321A during mixing and transfer operations. The majority of the released dilute coolant remained in the building. Approximately 2 gallons of dilute coolant escaped underneath the building wall to the east and flowed down the loading dock wall toward the northwest corner of the parking lot. Absorbent material was placed to protect the storm drain and no coolant entered the storm drain. All of the contaminated absorbent material was immediately swept up and containerized for management as hazardous waste. The coolant released within the building was vacuumed up and placed in a 55-gallon drum.
6/2/11	B-174	Tygon tubing, which provides LCW to a piece of equipment, slipped off its connection to that device. Approximately 2,000 gallons of LCW water was released to the area underneath and around the capacitor bank building. No oil sheen was observed on the surface of the water. MUSD High Voltage turned off power to the capacitors and the LCW water was turned off. There was no sign of breached capacitors or ignitrons. The LCW water was allowed to evaporate from the paved surfaces around and under the building.
6/9/11	B-132N	Approximately one cup of hydraulic oil was released onto asphalt from a pickup truck. Absorbent material was placed on the released fluid and fleet management personnel drove the truck to B-611 for repair. The spent absorbent was swept up and managed as waste. The spilled material did not reach the storm drainage system.
6/9/11	TFD	Approximately 28 gallons of untreated groundwater were released due to a disconnection between a hose and connector at TFD/Well W-1552. The untreated water was released to ground, where it is soaked in and evaporated. The release did not reach any storm drain or catch basin in the storm drain system. The untreated groundwater contained a total VOC concentration of 166 ppb. This is a CERCLA groundwater treatment unit, no CERCLA reporting requirements were triggered.
6/15/11	B-331	An emergency generator overheated during load testing, and four ounces of coolant were released to asphalt. The coolant was immediately cleaned up with absorbent.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
6/24/11	B-383	A personal truck parked on the southwest corner of B-383 leaked approximately two cups of oil from the truck bed onto the parking lot asphalt. The owner was able to identify the leaking material as oil from one of the tipped containers in the truck bed. The containers were righted and absorbent material was applied to the released oil on the asphalt. Additionally, absorbent material was placed in the bed of the truck. All of the released oil and used absorbent was cleaned up. None of the released oil reached a storm drain or contacted soil.
6/26/11	T-3527	Less than five hundred gallons of potable water discharged from a pressure regulator located on the south side of T-3527. The pressure relief valve had developed a 1/4-inch hole in it. The water flowed to an unpaved storm drain located adjacent to West Inner Loop Rd and percolated into the ground; the water did not flow off site.
6/28/11	B-419	An unusual June storm produced approximately 0.64 inches of rainfall late in the afternoon and evening, generating runoff from a concrete slab that is part of an Interim Facility undergoing RCRA Closure, which had been uncovered for characterization sampling. The runoff flowed to storm drains that eventually reach the Arroyo Las Positas after flowing through Lake Haussmann, an over nine million gallon wet basin on site. Results for copper, lead, zinc, cyanide, and gross beta were found to exceed historical comparison values. However, the historical comparison values were developed for the downstream discharge location, so elevated values upstream are not necessarily indications of a water quality issue. LLNL does not believe that any of these results had the potential to impact downstream water quality. The area of the concrete pad is less than 0.15 acres, which would have resulted in a total of approximately 2,600 gallons of runoff specific to the pad itself. That runoff would have joined with runoff from approximately 40 acres within the same sub-watershed before discharging to Lake Haussmann on site. This volume would be on the order of 625,000 gallons assuming a runoff coefficient of 0.9, so the discharge from the pad would be about 0.4% of the discharge into Lake Haussmann. The Lake then contains more than nine million gallons of additional water. Therefore, by the time the discharge from the B-419 pad reached the Arroyo Las Positas, it would not have been expected to result in any impact to the aquatic ecosystem. This release was reported by phone and email to SFBRWQCB.
7/3/11	B-481	A break in a two-inch water line, which supplies an irrigation line at B-481, resulted in potable water bubbling up from the ground. Water flowed along a walk way north of B-481 into parking lot D-9, entered a storm drain basin on the east side of the parking lot, and traveled to the Arroyo Las Positas. Total volume of the release was between 2,000 and 5,000 gallons. MUSD personnel excavated and repaired the leak. This release was reported by phone and emailed to SFBRWQCB.
7/9/11	B-625	Hydraulic fluid leaked from a boom truck being used by landscaper to trim trees near B-625. The volume of spilled hydraulic fluid was estimated to be less than one pint. Absorbent pads were used, contaminated soil was removed, and all contaminated material was managed as hazardous waste. The hydraulic line was replaced, and the equipment was returned to service.
7/19/11	U424 Substation	Approximately 25 to 30 gallons of mineral oil was released to gravel in the U424 substation yard. As part of repair activities, mineral oil was being temporarily transferred from transformer T900 into a tanker truck when the valve on the truck failed to open. Work was stopped immediately and the on-site spill response equipment was utilized to contain the spill. The released mineral oil was quickly contained and did not discharge to the storm drainage system or an arroyo. The affected gravel and underlying soil area were cleaned using a flat-nosed shovel to remove absorbent that had placed on the spill area, the mineral oil contaminated gravel, and a portion of the underlying soil. All of the contaminated material was managed as hazardous waste.
7/27/11	B-495 WAA	A 600-gallon tank, holding personnel shower water, had a small leak and less than one cup had dripped onto the floor of the B-495 WAA. The water was cleaned up and a photo tray was placed under the leak. The contents of the leaking tank were pumped into a new tank upon approval of the program's work permit.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
8/1/11	B-551E	Approximately 14,250 gallons of potable irrigation water were discharged near B-551E from a stuck irrigation valve, which has been repaired, on a 2-inch supply line. Approximately half the released water infiltrated into the landscaping; the remaining volume traveled into storm drains around the building, flowed into Lake Haussmann and mixed with more than nine million gallons of lake water. Although Lake Haussmann discharges to the Arroyo Las Positas, the blended water presented no threat to Arroyo Las Positas. This release was reported by phone and written notification to the SFBRWQCB.
8/2/11	T-6475	During equipment acceptance phase testing at a recently constructed computer facility, approximately 100 to 200 gallons of water were discharged from a computer cooling system. The water flowed onto soil along the south side of T-6475, and traveled south and then east toward South Outer Loop Road. The source of the discharge was identified and the open valve was secured. There was no evidence that the water reached a storm drain or an arroyo.
8/4/11	B-132S	A two-inch irrigation valve stuck open on the west side of B-132S and approximately 17,850 gallons of potable water were released to the landscaped area then flowed onto the asphalt, across the parking lot, and into the Livermore Site storm drain system. The water flowed westward under West Perimeter Drive into an approximately 90-foot long unpaved storm drain channel that discharges into a drainage pipe that ultimately discharges into the Arroyo Seco. Due to vegetation and security fencing, it was not possible to observe if the water reached the Arroyo Seco; however, it is likely that a small quantity did reach the arroyo. Since the irrigation water flowed across paved areas and through an unpaved storm channel with vegetation, there was no potential for erosion. Also, given the water flow path, it is unlikely that any residual chlorine in the discharge would impact the Arroyo Seco. This release was reported by phone and written notification to the SFBRWQCB.
8/6/11	B-123	A construction crew broke a 1-inch PVC irrigation main line from a 1-inch valve located on the east side of B-123. Although the water was turned off immediately and the line was repaired, about 150 gallons were discharged to the landscaped area. The water soaked into the ground and did not reach a storm drain or an arroyo.
8/8/11	B-123	Construction activity (see above) also broke six heads on the irrigation system located along the east side of B-123. During the next system cycle (8/8/11) and before the system could be turned off, approximately 5,000 gallons of irrigation water were released; the majority of the water remained in the landscaped area. An estimated 1,000 gallons flowed from the landscaped area into the storm catch basin located northeast of B-123, then north and west under West Perimeter Drive into an approximately 90-foot long unpaved storm drainage channel located on LLNL property. The irrigation water appears to have remained within the unpaved storm drainage channel and did not reach the Arroyo Seco. Since the irrigation water flowed across paved areas and through an unpaved storm channel with vegetation, there was no potential for erosion. Also, given the water flow path, it is unlikely that any residual chlorine in the discharge would impact the unpaved storm drainage channel.
8/15/11	B-132S	Approximately four ounces of diesel fuel dripped onto asphalt from the fuel tank of a pickup truck located in the parking lot south of B-132S. Absorbent was immediately placed on the fuel, and after the vehicle was moved the spent absorbent was collected for final disposal. There was no discharge of diesel fuel to the storm drainage system or an arroyo.
8/20/11	B-361	Approximately a half-gallon of diesel fuel spilled onto a grassy area from a loose fuel line to a welding machine on the southeastern side of B-361. Absorbent pads were used to soak up as much fuel as possible, then dry-sorb was placed on the area. The sorbent, along with contaminated grass and soil, was placed in a 55-gallon drum to be managed as hazardous waste. No diesel fuel reached a storm drain or an arroyo.
8/24/11	B-581	Approximately 300 to 450 gallons of DI water was released outside at the northwest end of the B-581 corridor. There is no evidence that the discharge reached the outfall which discharges into Arroyo Las Positas.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
8/25/11	B-453	Approximately one quart of vegetable oil leaked from transformer T-1861 near B-453. Most of the oil remained on the concrete pad with a very small amount dripping onto the gravel. Pigs were laid around the transformer and dry-sorb was spread onto the oil. The vegetable oil did not discharge into the storm drainage system or an arroyo, and the area was immediately cleaned.
8/27/11	B-255	Approximately 6,000 gallons of irrigation water were discharged into a landscaped area when an irrigation control valve was left slightly open, and about 200 to 300 gallons discharged into the nearby storm drain. MUSD mechanics immediately shut off the water at the irrigation backflow preventer. It was confirmed that the receiving storm drainage channel was dry; thus it appears that the release soaked into ground before reaching the arroyo.
9/6/11	B-490	Approximately one-half gallon of hydraulic oil spilled from a garbage truck in the southeast area of parking lot D-9, northeast of B-490. Absorbent was used to clean up the oil. There was no discharge into the storm drainage system or an arroyo.
9/12/11	B-432	Approximately one gallon of air compressor condensate was observed on asphalt on the south side of B-432, adjacent to a recently installed air compressor. Water from the compressor discharge lines was discharging into a secondary containment tray that overflowed, but there was no evidence that water flowed anywhere near storm drains. After sampling and analysis, the contents of the containment tray were discharged to the sanitary sewer as a temporary corrective action to establish containment capacity. The program is developing a short-term fix to collect and manage the condensate, while a determination is made regarding routing the discharge to the sanitary sewer as a long-term solution. None of the released water reached soil, a drainage culvert, or storm drain. All of the released water remained on the asphalt surface and evaporated.
9/13/11	B-581	Approximately 10-15 gallons of coolant was released to asphalt from a garbage truck on Avenue N. The vehicle stopped at the B-581 southwest access gate, where a small volume of coolant, less than two gallons, entered the storm drain catch basin on the north side of Avenue N. Dryorb was immediately placed on the surface to protect the storm drain from receiving further discharge and dryorb was also placed on the affected asphalt surface along Avenue N. All coolant that entered the storm drain was contained in the catch basin. A pump-out device was used to collect and remove all of the contaminated water and sediments from the catch basin. Collected water from the catch basin and the used dryorb from the asphalt were managed through RHW for disposal as hazardous waste.
9/16/11	T-6325	Approximately two hundred gallons of water leaked from an underground water pipe and pooled next to the fire riser on the south side of the trailer. None of the water reached the nearby storm culvert that is approximately 30 feet away.
9/29/11	B-582	Workers performing maintenance on the fire suppression system released water along the top of a ventilation louver that allows air exchange with the outside. A minor amount of water quickly evaporated when released to the outside asphalt. The inside wall of this room is within a buffer zone for tritium. Swipe results confirmed that there was no tritium contamination of the water that dripped outside the louver onto the ground. Due to the high evaporation rate, no water lasted long enough to clean up.
9/26/11	TFD-SE	An estimated 200 gallons of untreated groundwater containing TCE (worst case concentration 400 ppb) were released from a broken pipe at TFD-SE (near parking lot E-5). The untreated water flowed northward across the asphalt pathway and into the soil along the dry channel. No clean up of the spill was performed since the water had evaporated from the asphalt or soaked into the soil. The release did not reach any storm drain or catch basin in the storm drain system. This is a CERCLA groundwater treatment unit, no CERCLA reporting requirements were triggered.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
10/17/11	B-321C	Approximately 200 mL of oil were released to the concrete surface on the north exterior of B-321C from a drum that had been turned upside down. The oil was immediately cleaned up using absorbent material; all of the oil was collected and appropriately disposed. None of the material reached soil or a storm drain.
10/25/11	B-274	Sewage overflowed from manhole number 315B on the west side of B-274. Approximately ten gallons of sewage were released onto soil between the asphalt walkway and the south side of Parking Lot B-7. MUSD staff cleaned up the affected area with a diluted bleach solution. The spilled material did not reach the storm drainage system or arroyos.
11/02/11	B-381	Approximately one liter of diesel spilled onto the asphalt on the north side of B-381. A contractor was performing maintenance on a diesel generator when a loose fitting came off and spilled diesel fuel inside and underneath the generator. The contractor immediately applied absorbent; RHWM responded and cleaned up the accessible liquid. Residual diesel continued to drip slowly from the internal frame of the generator so absorbent was left on the ground under the generator, and was cleaned up the next day. No diesel reached a storm drain, bare ground or the arroyo.
11/08/11	B-235	Approximately 6,600 gallons (a worst case estimate) of potable water were released from a leak in a hot water line under a sink into office areas in B-235. Upon discovery, the leak was secured and clean-up activities were initiated. Approximately 500 gallons of the water ponded in the building; that water was collected and disposed of to the sanitary sewer. The remaining approximately 6,000 gallons would be the maximum amount that may have been released to ground outside. However, the absence of standing water suggests that the actual amount of water released outdoors was less than the conservative estimate. From the building, the water flowed to a nearby storm drain, where it then could have traveled north in the storm drain system to the Arroyo Las Positas. The water that flowed to the storm drain was not recoverable as it soaked into the storm drain channel. There was no evidence that the water flow continued past the open storm drain channel along the roundabout at West Inner Loop Road and Westgate Drive. Therefore, the discharge is not believed to have reached the Arroyo Las Positas. Nevertheless, this release was reported by phone and written notification to the SFBRWQCB.
11/13/11	B-482	An irrigation water release was observed in the landscaped area near the southwest entrance to B-482. The release was report to MUSD personnel and immediately shut off. Approximately 500-1,000 gallons of water were released; the majority of the released water soaked into the landscaping and a small percentage entered a storm drain grate. It is believed that water entering the storm drain flowed northwest, co-mingling with water discharged from an ERD treatment facility, before entering the Arroyo Las Positas and flowing off site. This release was reported by phone and written notification to the SFBRWQCB.
11/21/11	PTU-09	A broken fitting discharged less than 200 gallons of untreated groundwater containing VOCs onto asphalt from groundwater treatment facility PTU-09 near T-3427. This is a CERCLA groundwater treatment unit, and no CERCLA reporting requirements were triggered. No water reached soil, the storm drainage system, or the sanitary sewer system; it was all contained on the asphalt. No cleanup of the released groundwater was performed. The groundwater on the asphalt was allowed to evaporate.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
12/14/11	B-365	<p>Water from an eyewash station, which potentially ran overnight, flowed into a floor drain that is connected to the B-365 retention tank system. Both retention tanks filled with water and overflowed into the berm. About 100 gallons of waste water escaped the berm in the retention tank system, ran across the driveway north of B-365, and soaked into soil under nearby pine trees. No water entered a storm drain.</p> <p>The retention tank system is used only for non-infectious, non-hazardous, and non-radioactive wastewater. The Industrial Hygienist confirmed that the wastewater did not pose a health concern. The remaining wastewater was then pumped out of both the retention tanks and the berm into a vacuum tanker and sampled. In accordance with procedure, the water was analyzed and released to sanitary sewer.</p>
12/19/11	B-453	<p>A potable water release occurred due to a break in a fire suppression sprinkler system inside B-453. A leak was believed to have begun at approximately 7:00 pm and flowed for about 20 minutes. Approximately 1,000 gallons were released inside the building and less than 400 gallons flowed from the building into a storm drain on the east side of B-453. Water in the storm drain flowed into Lake Haussmann, where it comingled with the lake water, discharged to the Arroyo Las Positas, and flowed off site. Comingled with the approximately nine million gallons of water in Lake Haussmann, the water quality and flow volume from the lake would be expected to be relatively unchanged by this discharge. This release was reported by phone and written notification to the SFBRWQCB.</p>
12/27/11	T-6475	<p>A potable water line that serves T-6475 broke due to the pipe freezing. The line was repaired within a few hours of discovery; however, it was not known when the leak started. Based on the size of the crack and water pressure in the system, it was estimated that approximately 200 gallons of water were released. The discharged water was contained in the landscape area adjacent to T-6475. No water entered into the storm drainage system or the arroyo.</p>
1/5/12	Well-1903	<p>Untreated groundwater discharged from Well W-1903 south of B-543, due to a loose hose fitting. An estimated 340 gallons containing 68 ppb VOCs, with TCE as the most significant analyte at 30 ppb, were discharged. The discharged water remained on the asphalt pad. It did not reach the ground, any storm drains or an arroyo. This is a CERCLA groundwater treatment unit, and no CERCLA reporting requirements were triggered.</p>
1/10/12	B-482	<p>There was a small leak in the window washing water loop on B-482. All water discharged into a landscaped area, none migrated onto asphalt or into a storm drain.</p>
1/11/12	B-132N	<p>An estimated 5,000 gallons of irrigation water leaked from a broken pipe between B-131 and B-131N. This water flowed onto the asphalt and into storm catch basins on the east side of B-132N. It continued north and flowed into storm catch basins on the south side of Third Street. Farther down the storm drainage system, the catch basins on Outer Loop Road were dry. The discharge did not reach the Arroyo Las Positas and did not flow off site.</p>
1/17/12	T-4675	<p>A half-inch potable water line released water onto the roof of T-4675. Although the line was secured upon discovery of the leak, water overflowed the roof edges on both the north and south sides for about 20 minutes. The exact amount of water released is unknown; however, it was estimated to be less than 10,000 gallons. The majority of the water on the south side of T-4675 soaked into the surrounding landscaped area with a minimal amount that flowed onto the nearby asphalt. The water on the north side overflowed onto an asphalt walkway and then flowed into the adjacent landscaped area. None of the water flowed off site.</p>
1/17/12	B-364	<p>Water was discovered discharging from a downspout on the northeast corner of B-364 at 6:45 a.m., and the leak was stopped at approximately 8:45 a.m. Although MUSD and facility personnel could not determine when the leak started, with a flow rate of about 30 gpm, the MUSD supervisor estimated the volume to be less than 10,000 gallons. The leak was DI water that served a humidifier located on the roof of the building. It was confirmed that open channels in the storm drainage system between B-364 and the arroyo were dry; thus, this release does not appear to have reached the Arroyo Las Positas.</p>

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
1/17/12	B-366	Water was released from an irrigation line near B-366. The discharge was stopped upon discovery. The volume of water released is not known, but it is believed to be far less than 10,000 gallons. It was confirmed that open channels in the storm drainage system near Parking Lot C-8 (between B-366 and the arroyo) were dry; thus, this release does not appear to have reached the Arroyo Las Positas.
1/24/12	B-625	Approximately one pint of diesel fuel leaked onto the asphalt within the RHWB B-625 yard from a portable vacuum tanker. A trail of diesel fuel approximately 10 feet long by 2.5 feet wide was visible near the tongue of the trailer. Dryorb was spread on the fuel stain, then later swept up and containerized for management as waste by RHWB. The spill was confined to the asphalt surface; none of the spilled diesel fuel reached a storm drain or soil.
2/06/12	Library Drive at North Inner Loop Rd	Approximately one-half gallon of hydraulic oil leaked onto asphalt from an aerial lift at the intersection of North Inner Loop Road and Library Drive. Absorbent and pigs were used to soak up the spill. The cleanup was completed within approximately 1.5 hours of the initial discovery. None of the hydraulic oil reached the storm drainage system.
2/24/12	B-571	Gasoline spilled from a personal vehicle in the east end of the F-7 parking lot, just north of B-571. An estimated two gallons of gasoline was spilled onto the asphalt directly below the car; a stain approximately 4 feet by 4 feet remained under the car. The Fire Department responded, applied absorbent to the spill and cleaned up the absorbent. The car was removed from the site. The gasoline did not reach any storm or sewer drains and did not enter any soil.
2/27/12	PTU-09	Approximately 50-75 gallons of untreated groundwater discharged from PTU-09. PTU-09 is surrounded by asphalt, and the discharge did not enter a storm drain. This is a CERCLA groundwater treatment unit, and no CERCLA reporting requirements were triggered.
2/27-2/28/12	LLNL Water Tank at SNL	During refilling of an LLNL water tank located on the site of the Sandia National Laboratory (SNL), a leak was observed in a hatch. The repairs required draining the water level in the tank, identifying the issue, ordering parts, implementing the repair, and refilling the tank. Approximately 50,000 gallons of potable water were released to the Arroyo Seco on February 27-28, 2012. The discharge was dechlorinated and the flow controlled to prevent erosion. All repairs are now complete, the water tank has been filled and is back in service. This release was reported by phone and written notification to the SFBRWQCB.
3/8/12	TFB	A small release of untreated groundwater occurred along a pipeline that carried groundwater from wells W-357 and W-704 to TFB. Approximately 75 gallons were released directly to ground, where it soaked in and evaporated. The TFB interlock was shut down to stop the release and the discharge did not reach the storm drain system or an arroyo. This is a CERCLA groundwater treatment unit, and no CERCLA reporting requirements were triggered.
3/9/12	B-582	Approximately three to four gallons of decanted saw cut slurry were discharged to the storm drain in the asphalt area near the dumpsters west of B-582. This slurry was collected in the B-581 pit and tested to ensure that it was not contaminated with tritium. Typically, the slurry is dried and the solid is disposed of in the municipal trash or with soils going to landfill. In this case, the material was mistakenly discharged to the storm drain. The majority of the material dried on the walls and bottom of the storm drain vault. The material was hosed down and recovered with the vacuum hose by RHWB personnel. The downstream manhole was checked to verify that the discharge did not travel downstream and therefore did not go off site.
3/14/12	B-451	An estimated half-gallon of hydraulic oil leaked onto asphalt from the hydraulic lift on the back of a subcontractor's flatbed truck. The truck was located northeast of B-451 on the side street that intersects with Fifth Street. RHWB technicians immediately responded to the spill site, used absorbent to clean up the hydraulic oil, and managed the waste. The spill did not reach the storm drainage system or an arroyo.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-1. May 1, 2011 – April 30, 2012 - Summary of Nonroutine Releases, Livermore Site.

Date	Location	Description
3/23/12	B-418	Approximately one-half gallon of gasoline spilled onto concrete and asphalt from a 5-gallon can located in the bed of a government pickup truck. At the time of the incident, the truck was parked on the west side of B-418. The spill was immediately cleaned up using absorbent, which was collected for final disposal by an RHW technician. The released gasoline did not discharge into the storm drainage system or an arroyo.
3/29/12	B-195	A potable water release occurred due to a failure of an irrigation controller on the south side of Building 195. The malfunctioning irrigation controller allowed water to flow to two valves, connected to a sprinkler and drip irrigation system, not currently in use. One of the sprinklers on those lines had a broken spray head. Based on reports from staff in the area, the maximum time over which the release may have occurred is 5.5 hrs (from 11:00 a.m. to 4:30 p.m.). Flow from the irrigation line was approximately 20 gpm. The estimated maximum discharge volume is up to 6,600 gallons of potable water; although based on observation of the flow, the actual release was likely less. The potable water release flowed west and then north in LLNL storm drains, where it comingled with treated ground water discharges from CERCLA treatment units, discharged to the Arroyo Las Positas, and flowed off site. No impacts to the environment were observed or are expected from this discharge. This release was reported by phone and written notification to the SFBRWQCB.
3/29/12	B-264	Approximately 0.25 gallon (about one liter) of hydraulic oil was spilled from a malfunctioning hydraulic lift on the back of a government pickup truck. The spill was cleaned up immediately by RHW Technicians using absorbent pads and dryorb. The spill did not reach the storm drainage system or an arroyo.

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-2. Summary of best management practice inspections in potential pollutant source/industrial activity areas.

Principal Directorate Responsible for Potential Pollutant Source/Industrial Activity	Deficiencies in BMPs or BMP Implementation and Additional/Revised BMPs or Corrective Actions.
1-Director's Office/Security Organization	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
2-Engineering	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
3-Computation	<u>B041</u> : Outdoor storage of materials/equipment could degrade storm water quality. Remove, relocate, or cover noted items. <u>B117</u> : Pine needles covering roof drain/gutter. Roof downspouts blocked with debris. Maintenance has been requested.
4-Physical & Life Sciences	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
5-Global Security	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
6-Weapons and Complex Integration	No deficiencies were found.
7-National Ignition Facility and Photon Science	<u>B381, B493, T2825, T3724, T3725, T3726, T3982, T6889</u> : Storm drain maintenance required to remove debris and prevent blockage. <u>B391</u> : Install barrier to protect storm drain from potential spills. <u>B162, B165, B392, T3725</u> : Repair water line leak or drain line blockage/connection. <u>B162, B165, B392, B490, B581, T3724, T3725, T4999, T5900-Corpyard</u> : Outdoor storage of materials/equipment could degrade storm water quality. Remove, relocate, or cover noted items. Improve general housekeeping. Maintain secondary containment, where appropriate.
8-Operations and Business	<u>B142, B151, B152, B154, B155, B235</u> : Storm drain maintenance required to remove debris and prevent blockage. <u>B364</u> : Repair slow leak from hot water boiler (sight glass gasket) that is dripping liquid onto ground outside the building. <u>B121, B423</u> : Stabilize or remove flaking lead-based exterior paint. <u>B121</u> : Replace degraded/missing insulation on exposed exterior pipes. <u>U283, B411, U448, OS518, B551</u> : Repair/replace lids on outdoor trash dumpsters to exclude rainwater. <u>B406, ERD S200 Facilities (PTU5, TFD-SS, TFE-E, TFE-HS, VTFD-ETC)</u> : Outdoor storage of materials/equipment could degrade storm water quality. Remove, relocate, or cover noted items. Improve general housekeeping. Maintain secondary containment, where appropriate. <u>U193, B235</u> : Reseal exposed concrete/fiberglass in secondary containment structures.

Table A-3. Record of Dry Season Observations.				Discharge Observations		
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Observations	Description
ALPE	Karl Brunckhorst	27-Jun-11	9:53 AM	Leaves, sticks, paper		
ALPO	Karl Brunckhorst	27-Jun-11	9:51 AM	Leaves, sticks		Soil disturbing activities taking place around sample location
ASS2	Karl Brunckhorst	27-Jun-11	9:32 AM	Leaves, sticks		
ASW	Karl Brunckhorst	27-Jun-11	9:41 AM	Leaves, sticks		ERD'S Treatment Facility "A" is discharging, no corrective action needed
AVE. K	Karl Brunckhorst	27-Jun-11	10:26 AM	Leaves, sticks, paper, plastic		
B111	Karl Brunckhorst	27-Jun-11	9:37 AM	Leaves, sticks		
B-191 / HEAF	Karl Brunckhorst	27-Jun-11	10:13 AM		Clean	
B194	Karl Brunckhorst	27-Jun-11	10:09 AM		Clean	
B341	Karl Brunckhorst	27-Jun-11	10:00 AM	Leaves		No work activity going on
B391	Karl Brunckhorst	27-Jun-11	10:04 AM	Leaves, sticks		
B551W	Karl Brunckhorst	27-Jun-11	9:57 AM	Leaves, sticks		
GRNE	Karl Brunckhorst	27-Jun-11	9:49 AM	Leaves, sticks, paper, plastic		
LABOR ONLY	Karl Brunckhorst	27-Jun-11	10:32 AM		Clean	Evidence of rinsing activities where non-hazardous materials are being removed within containment area, no corrective action taken
WPDC	Karl Brunckhorst	27-Jun-11	9:45 AM	Leaves, sticks		Lake Haussmann & ERD Treatment Facility B discharging, no corrective action needed
ALPE	Karl Brunckhorst	21-Sep-11	10:11 AM	Leaves, sticks, paper		
ALPO	Karl Brunckhorst	21-Sep-11	10:09 AM	Leaves, sticks, paper, plastic		Grading and soil disturbing activities observed near sample location.
ASS2	Karl Brunckhorst	21-Sep-11	9:47 AM	Leaves, sticks		
ASW	Karl Brunckhorst	21-Sep-11	9:58 AM	Leaves, sticks, paper		ERD's Treatment Facility "A" is discharging, no corrective action needed
AVE. K	Karl Brunckhorst	21-Sep-11	9:38 AM	Leaves, sticks, paper, plastic		Evidence of irrigation water

Table A-3. Record of Dry Season Observations.				Discharge Observations		
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Observations	Description
B111	Karl Brunckhorst	21-Sep-11	9:51 AM	Leaves, sticks		
B191 / HEAF	Karl Brunckhorst	21-Sep-11	9:13 AM		Clean	
B194	Karl Brunckhorst	21-Sep-11	9:17 AM		Clean	
B341	Karl Brunckhorst	21-Sep-11	9:30 AM	Leaves		No work activity going on
B391	Karl Brunckhorst	21-Sep-11	9:22 AM	Leaves, sticks		
B551W	Karl Brunckhorst	21-Sep-11	9:35 AM	Leaves, sticks		
GRNE	Karl Brunckhorst	21-Sep-11	10:07 AM	Leaves, sticks, plastic		
LABOR ONLY	Karl Brunckhorst	21-Sep-11	9:41 AM	Leaves		Evidence of rinsing activities where non-hazardous materials are being removed within containment area, no corrective action needed
WPDC	Karl Brunckhorst	21-Sep-11	10:01 AM	Leaves, sticks		Lake Haussmann and ERD's Treatment Facility "B" is discharging, no corrective action needed

Table A-4. Record of Wet Season Observations.

Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Discharge Observations		Comments
					Turbidity	Runoff	
ALPE	Bob Williams	6-Oct-11	3:13 PM	Leaves, sticks	High	Significant	
ALPO	Karl Brunckhorst	6-Oct-11	3:00 PM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Crystal Rosene	6-Oct-11	3:15 PM	Leaves, sticks	High	Significant	
ASW	Crystal Rosene	6-Oct-11	3:30 PM	Leaves, sticks	High	Significant	ERD's Treatment Facility "A" discharging. Non-Qualifying storm event
GRNE	Karl Brunckhorst	6-Oct-11	3:05 PM	Leaves, sticks	High	Significant	
WPDC	Karl Brunckhorst	6-Oct-11	4:00 PM	Leaves, sticks	High	Significant	ERD Treatment Facility B and Lake Hausmann discharging
ALPE	Karl Brunckhorst	29-Nov-11	10:28 AM	Leaves, sticks, plastic	No	No Runoff	
ALPO	Karl Brunckhorst	29-Nov-11	10:26 AM	Leaves, sticks, paper	No	No Runoff	
ASS2	Karl Brunckhorst	29-Nov-11	10:13 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	29-Nov-11	10:17 AM	Leaves, sticks	Low	No Runoff	ERD's Treatment Facility "A" discharging
GRNE	Karl Brunckhorst	29-Nov-11	10:25 AM	Leaves, sticks, paper	No	No Runoff	
WPDC	Karl Brunckhorst	29-Nov-11	10:20 AM	Leaves, sticks	Low	No Runoff	Lake Hausmann & ERD Treatment Facility B discharging
ALPE	Karl Brunckhorst	20-Dec-11	10:00 AM	Leaves, sticks, plastic	No	Insignificant	
ALPO	Karl Brunckhorst	20-Dec-11	10:05 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	20-Dec-11	10:13 AM	Leaves, sticks	No	No Runoff	

Table A-4. Record of Wet Season Observations.

Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Discharge Observations		Comments
					Turbidity	Runoff	
ASW	Karl Brunckhorst	20-Dec-11	10:17 AM	Leaves, sticks	Low	No Runoff	ERD's Treatment Facility "A" discharging
GRNE	Karl Brunckhorst	20-Dec-11	10:07 AM	Leaves, sticks, plastic	No	No Runoff	
WPDC	Karl Brunckhorst	20-Dec-11	10:21 AM	Leaves, sticks	Low	No Runoff	Lake Haussmann & ERD Treatment Facility B discharging
ALPE	Karl Brunckhorst	23-Jan-12	8:36 AM	Leaves, sticks	Moderate	Significant	Non-Qualifying storm event
ALPO	Karl Brunckhorst	23-Jan-12	8:39 AM	Leaves, sticks, paper, plastic	No	No Runoff	Non-Qualifying storm event
ASS2	Karl Brunckhorst	23-Jan-12	8:47 AM	Leaves, sticks	Moderate	Significant	Non-Qualifying storm event
ASW	Karl Brunckhorst	23-Jan-12	8:53 AM	Leaves	Moderate	Significant	ERD's Treatment Facility "A" discharging. Non-Qualifying storm event
GRNE	Karl Brunckhorst	23-Jan-12	8:42 AM	Leaves, sticks	Moderate	Significant	Non-Qualifying storm event

Table A-4. Record of Wet Season Observations.

Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Discharge Observations		Comments
					Turbidity	Runoff	
WPDC	Karl Brunckhorst	23-Jan-12	9:00 AM	Leaves, sticks	Moderate	Significant	Lake Hausmann & ERD Treatment Facility B discharging. Non-Qualifying storm event
ALPE	Karl Brunckhorst	29-Feb-12	8:30 AM	Leaves, sticks, plastic	No	No Runoff	
ALPO	Karl Brunckhorst	29-Feb-12	8:25 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	29-Feb-12	8:10 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	29-Feb-12	8:14 AM	Leaves, sticks, paper	Low	No Runoff	ERD's Treatment Facility "A" discharging. Non-Qualifying storm event
GRNE	Karl Brunckhorst	29-Feb-12	8:23 AM	Leaves, sticks, paper, plastic	No	No Runoff	
WPDC	Karl Brunckhorst	29-Feb-12	8:19 AM	Leaves, sticks	Low	No Runoff	Lake Hausmann & ERD Treatment Facility B discharging
ALPE	Karl Brunckhorst	28-Mar-12	10:38 AM	Leaves, sticks	No	No Runoff	
ALPO	Karl Brunckhorst	28-Mar-12	10:36 PM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	28-Mar-12	10:22 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	28-Mar-12	10:25 AM	Leaves, sticks	Low	No Runoff	ERD's Treatment Facility "A" discharging
GRNE	Karl Brunckhorst	28-Mar-12	10:34 AM	Leaves, sticks, paper, plastic	No	No Runoff	

Table A-4. Record of Wet Season Observations.

Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Gease?	Discharge Observations		Comments
					Turbidity	Runoff	
WPDC	Karl Brunckhorst	28-Mar-12	10:29 AM	Leaves, sticks, plastic	Low	No Runoff	Lake Haussmann & ERD Treatment Facility B discharging
ALPE	Karl Brunckhorst	13-Apr-12	10:38 AM	Leaves, sticks	Moderate	Significant	Non-Qualifying storm event
ALPO	Karl Brunckhorst	13-Apr-12	10:36 AM	Leaves, sticks, paper, plastic	Moderate	Significant	Non-Qualifying storm event
ASS2	Karl Brunckhorst	13-Apr-12	10:25 AM	Leaves, sticks	Moderate	Significant	Non-Qualifying storm event
ASW	Karl Brunckhorst	13-Apr-12	10:20 AM	Leaves, sticks	Moderate	Significant	ERD's Treatment Facility "A" discharging. Non-Qualifying storm event
GRNE	Karl Brunckhorst	13-Apr-12	10:33 AM	Leaves, sticks, plastic	Moderate	Significant	Non-Qualifying storm event
WPDC	Karl Brunckhorst	13-Apr-12	10:30 AM	Leaves, sticks, plastic	Moderate	Significant	Lake Haussmann & ERD Treatment Facility B discharging. Non-Qualifying storm event

*Lawrence Livermore National Laboratory Livermore Site
Annual Storm Water Monitoring Report for Waste Discharge Requirements 95-174
August 2012*

Table A-5. October 2011 - April 2012 daily rainfall totals (for days with >0.2 inches precipitation), Livermore Site.

Date	Precipitation Daily Total (Inches)	Day of Week	Description of Event	
10/05/2011	0.38	Wednesday	>0.24 by 7am	No Runoff
10/06/2011	0.54	Thursday	SAMPLED	
11/05/2011	0.22	Saturday		
01/20/2012	0.53	Friday	<0.1 by 5pm	No Runoff during hours of operation
01/21/2012	0.40	Saturday		
01/23/2012	0.28	Monday	<3 days w/o Runoff	
03/16/2012	0.67	Friday	<0.1 by 5pm	No Runoff during hours of operation
03/24/2012	0.54	Saturday		
03/25/2012	0.39	Sunday		
03/31/2012	0.33	Saturday		
04/10/2012	0.38	Tuesday	<0.25 by 5pm	No Runoff during hours of operation
04/12/2012	0.59	Thursday	<3 days w/o Runoff	
04/13/2012	0.36	Friday	<3 days w/o Runoff	
04/25/2012	0.34	Wednesday	<0.1 by 5pm	No Runoff during hours of operation

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE LOCATION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS				
			For First Storm Event				
			BASIC PARAMETERS				
			pH	TSS	O&G	TOC	DO
WPDC (ALP Effluent)	10/6/11	Ongoing					
	AM <input type="checkbox"/> 4:00 PM <input checked="" type="checkbox"/>	AM <input type="checkbox"/> PM <input checked="" type="checkbox"/>	7.66	960	<5	13	8.7
GRNE (ALP Influent)	10/6/11	Ongoing					
	AM <input type="checkbox"/> 3:05 PM <input checked="" type="checkbox"/>	AM <input type="checkbox"/> PM <input checked="" type="checkbox"/>	8.58	2600	<5	7.1	11
ALPO (ALP Influent)	10/6/11						
	AM <input type="checkbox"/> PM <input type="checkbox"/> Not Sampled	AM <input type="checkbox"/> PM <input type="checkbox"/> No Runoff	N/A	N/A	N/A	N/A	N/A
ALPE (ALP Influent)	10/6/11	Ongoing					
	AM <input type="checkbox"/> 3:13 PM <input checked="" type="checkbox"/>	AM <input type="checkbox"/> PM <input checked="" type="checkbox"/>	8.02	390	<5	11	9.7
TEST REPORTING UNITS:			pH Units	mg/L	mg/L	mg/L	mg O/L
TEST METHOD USED:			SM-4500HB	SM-2540D	E1664HEM	SM-5310C	SM-4500OG
ANALYZED BY (SELF/LAB):			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event			
	OTHER PARAMETERS			
	Beryllium	Bromacil	Cadmium	Chemical Oxygen Demand
WPDC (ALP Effluent)	<0.001	<0.5	<0.0005	61
GRNE (ALP Influent)	0.0033	5	0.002	130
ALPO (ALP Influent) Not Sampled No Runoff	N/A	N/A	N/A	N/A
ALPE (ALP Influent)	<0.001	<0.5	<0.0005	72
TEST REPORTING UNITS:	mg/L	ug/L	mg/L	mg O/ L
TEST METHOD USED:	E200.8	E525.2	E200.8	E410.4
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS						
	For First Storm Event						
	OTHER PARAMETERS						
	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury
WPDC (ALP Effluent)	0.021	<0.2	<1	<25	<0.002	0.0087	<0.0002
GRNE (ALP Influent)	0.16	<0.2	<1	56	<0.002	0.091	0.00045
ALPO (ALP Influent) Not Sampled No Runoff	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ALPE (ALP Influent)	0.034	<0.2	<1	26	<0.002	0.015	<0.0002
TEST REPORTING UNITS:	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
TEST METHOD USED:	E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS						
	For First Storm Event						
	OTHER PARAMETERS						
	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc
WPDC (ALP Effluent)	4.9	0.41	<1	<0.1	<0.3	45	0.23
GRNE (ALP Influent)	4.5	0.74	<1	<0.1	<0.3	190	0.46
ALPO (ALP Influent) Not Sampled No Runoff	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ALPE (Influent)	5.8	0.63	<1	<0.1	<0.3	190	0.12
TEST REPORTING UNITS:	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L
TEST METHOD USED:	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.8
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas
 TSS - Total Suspended Solids
 SC - Specific Conductance
 O&G - Oil & Grease
 TOC - Total Organic Carbon
 DO - Dissolved Oxygen
 N/A - Not Analyzed
 Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS			
	For First Storm Event			
	OTHER PARAMETERS			
	Gross alpha	Gross beta	Tritium	Plutonium 239+240
WPDC (ALP Effluent)	0.673 ± 0.178	0.936 ± 0.166	14.25 ± 4.74	0.00027 ± 0.00109
GRNE (ALP Influent)	2.886 ± 0.744	3.097 ± 0.548	-1.38 ± 2.76	N/A
ALPO (ALP Influent) Not Sampled No Runoff	N/A	N/A	N/A	N/A
ALPE (Influent)	0.186 ± 0.085	0.392 ± 0.085	0.53 ± 2.89	N/A
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906	AS:PUISO
ANALYZED BY (SELF/LAB):	GEL Labs	GEL Labs	GEL Labs	GEL Labs

Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE COLLECTION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS				
			For First Storm Event				
			BASIC PARAMETERS				
			pH	TSS	O&G	TOC	DO
ASW (Arroyo Seco Effluent)	10/6/11	Ongoing	6.96	180.	<5	10.	10
	AM <input type="checkbox"/>	AM <input type="checkbox"/>					
	3:30 PM <input checked="" type="checkbox"/>	PM <input checked="" type="checkbox"/>					
ASS2 (Arroyo Seco Influent)	10/6/11	Ongoing	6.85	150.	<5	9.5	10
	AM <input type="checkbox"/>	AM <input type="checkbox"/>					
	3:15 PM <input checked="" type="checkbox"/>	PM <input checked="" type="checkbox"/>					
TEST REPORTING UNITS:			pH Units	mg/L	mg/L	mg/L	mg O/L
TEST METHOD USED:			SM-4500HB	SM-2540D	E1664HEM	SM-5310C	SM-4500OG
ANALYZED BY (SELF/LAB):			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS			
	For First Storm Event			
	OTHER PARAMETERS			
	Beryllium	Bromacil	Cadmium	Chemical Oxygen Demand
ASW (Arroyo Seco Effluent)	<0.001	<0.5	<0.0005	<25
ASS2 (Arroyo Seco Influent)	<0.001	<0.5	0.00062	<25
TEST REPORTING UNITS:	mg/L	ug/L	mg/L	mg O/ L
TEST METHOD USED:	E200.8	E525.2	E200.8	E410.4
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS						
	For First Storm Event						
	OTHER PARAMETERS						
	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury
ASW (Arroyo Seco Effluent)	0.019	<0.2	<1	34.	<0.002	0.0095	<0.0002
ASS2 (Arroyo Seco Influent)	0.023	<0.2	<1	97.	<0.002	0.015	<0.0002
TEST REPORTING UNITS:	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
TEST METHOD USED:	E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS						
	For First Storm Event						
	OTHER PARAMETERS						
	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc
ASW (Arroyo Seco Effluent)	2.5	0.49	<1	<0.1	<0.3	22.	0.17
ASS2 (Arroyo Seco Influent)	2.4	0.6	<1	<0.1	<0.3	19.	0.25
TEST REPORTING UNITS:	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L
TEST METHOD USED:	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.8
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for October 6, 2011.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS			
	For First Storm Event			
	OTHER PARAMETERS			
	Gross alpha	Gross beta	Tritium	Plutonium 239+240
ASW (Arroyo Seco Effluent)	0.105 ± 0.064	0.257 ± 0.073	29.45 ± 7.44	- 0.00028 ± 0.00121
ASS2 (Arroyo Seco Influent)	0.186 ± 0.083	0.411 ± 0.100	0.40 ± 2.76	N/A
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906	E906
ANALYZED BY (SELF/LAB):	GEL Labs	GEL Labs	GEL Labs	GEL Labs

Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater



**Environmental Functional Area, Lawrence Livermore National Laboratory
P.O. Box 808, L-627, Livermore, California 94551**