LBNL's Surface Water Program

Overview

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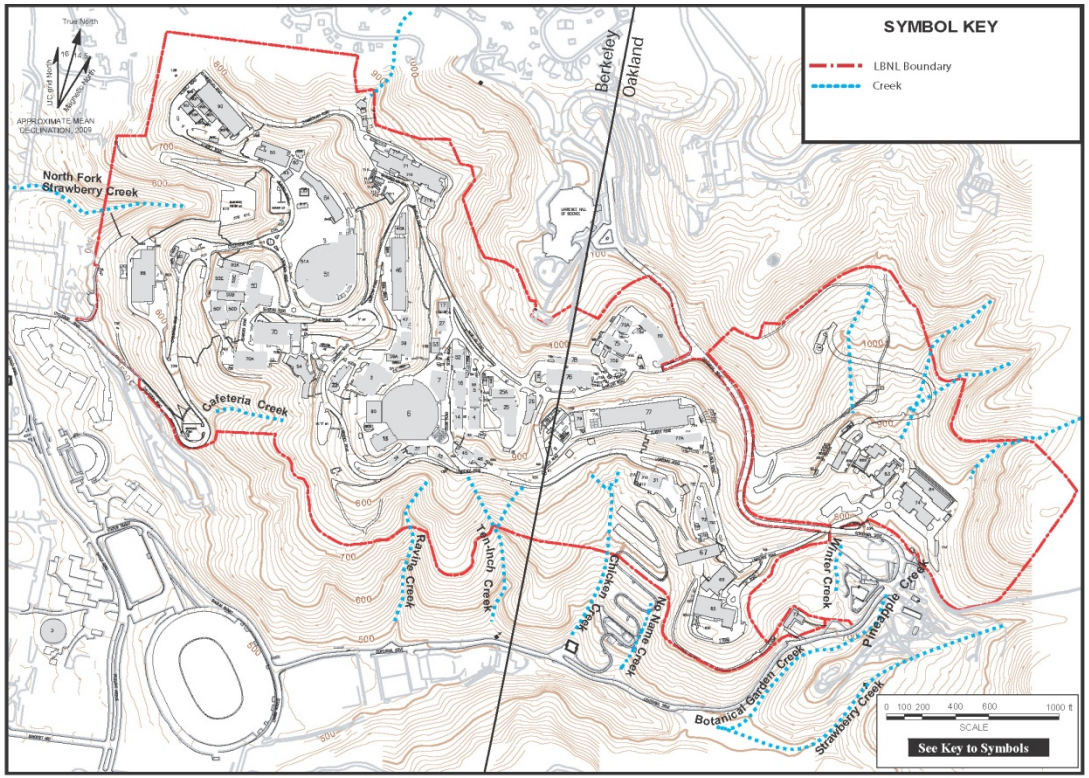
Environmental Services Group
Environment, Health, and Safety Division

November 2011

Overview

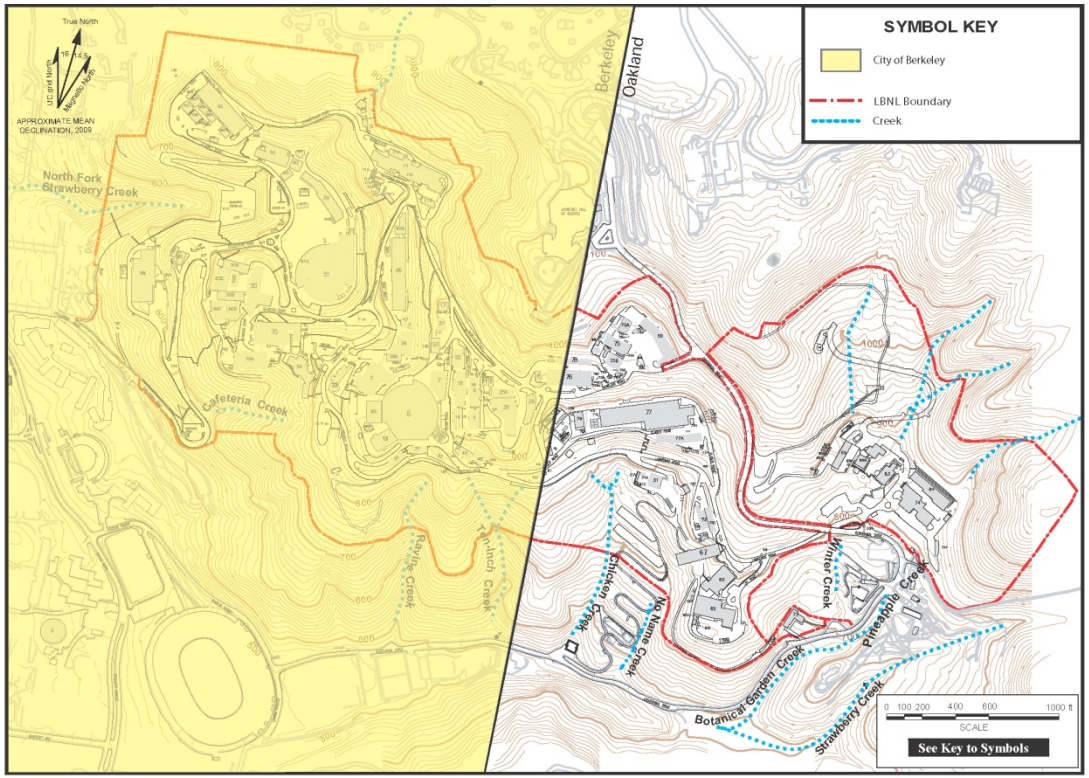
- Site information (site location, topography, buildings, Strawberry Watershed)
- Creek sampling locations, measurements, and results
- Stormwater discharges regulated under the Industrial General Permit (since 1992)
- Industrial areas monitoring points, stormwater locations, measurements, and results
- Construction projects regulated under Construction General Permit
  - Building 51 and Bevatron Demolition Project
  - Seismic Phase II
  - Old Town Demolition and Environmental Restoration
- Low Impact Development
- University of California Winter creek stabilization & enhancement project
- Questions

Site Information

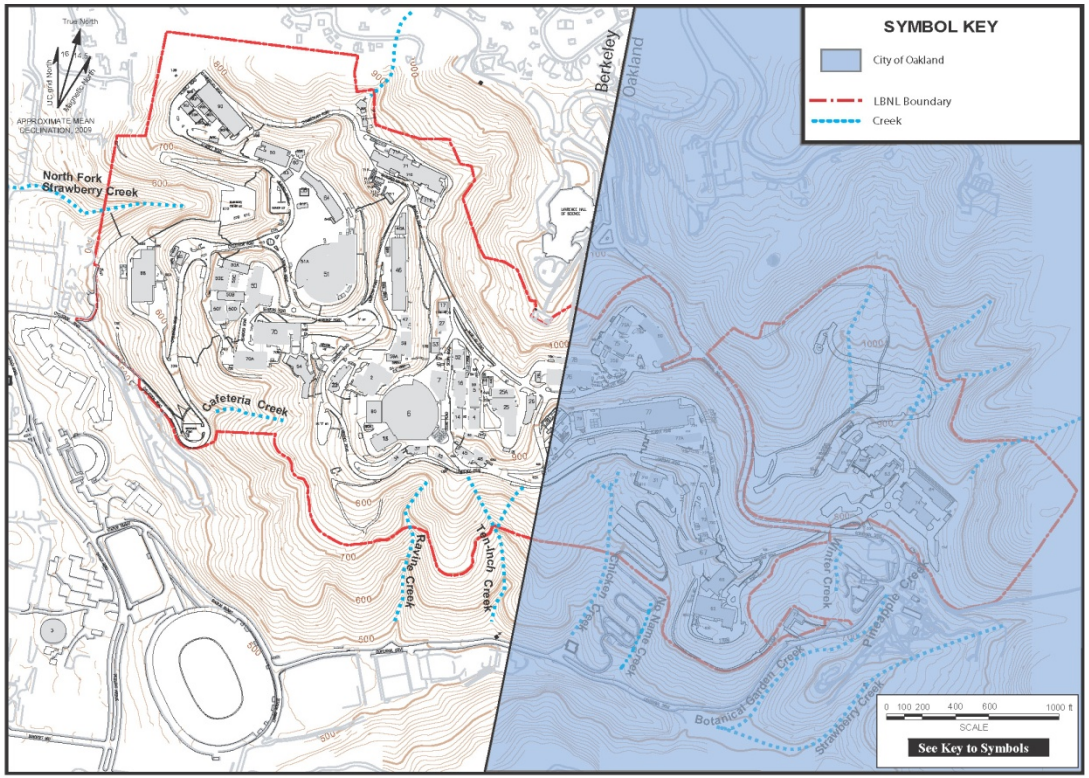


- Approximately 80 Permanent Buildings
- 100 Smaller Structures and Trailers

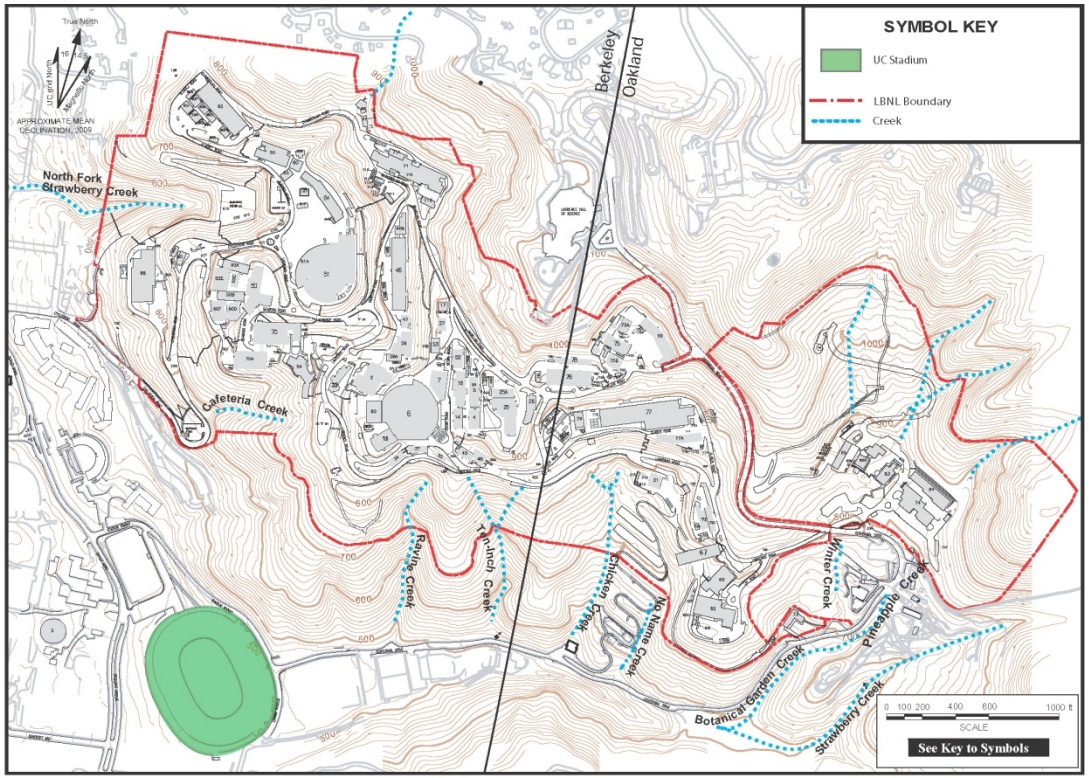
City of Berkeley



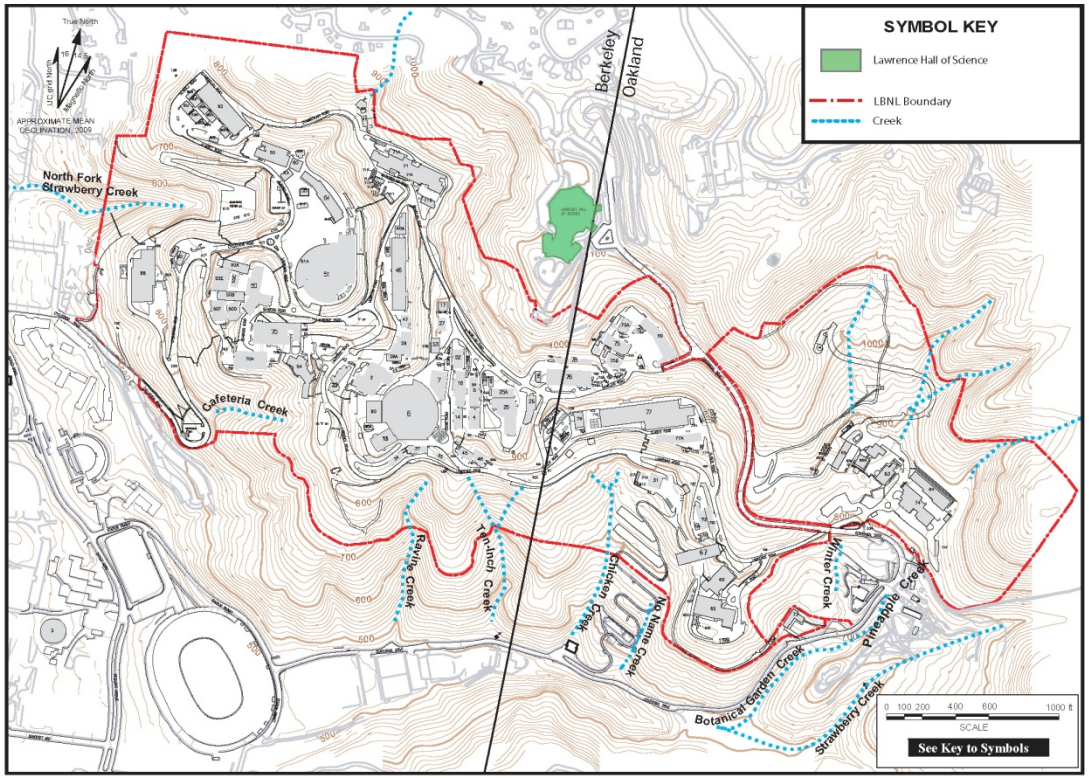
City of Oakland



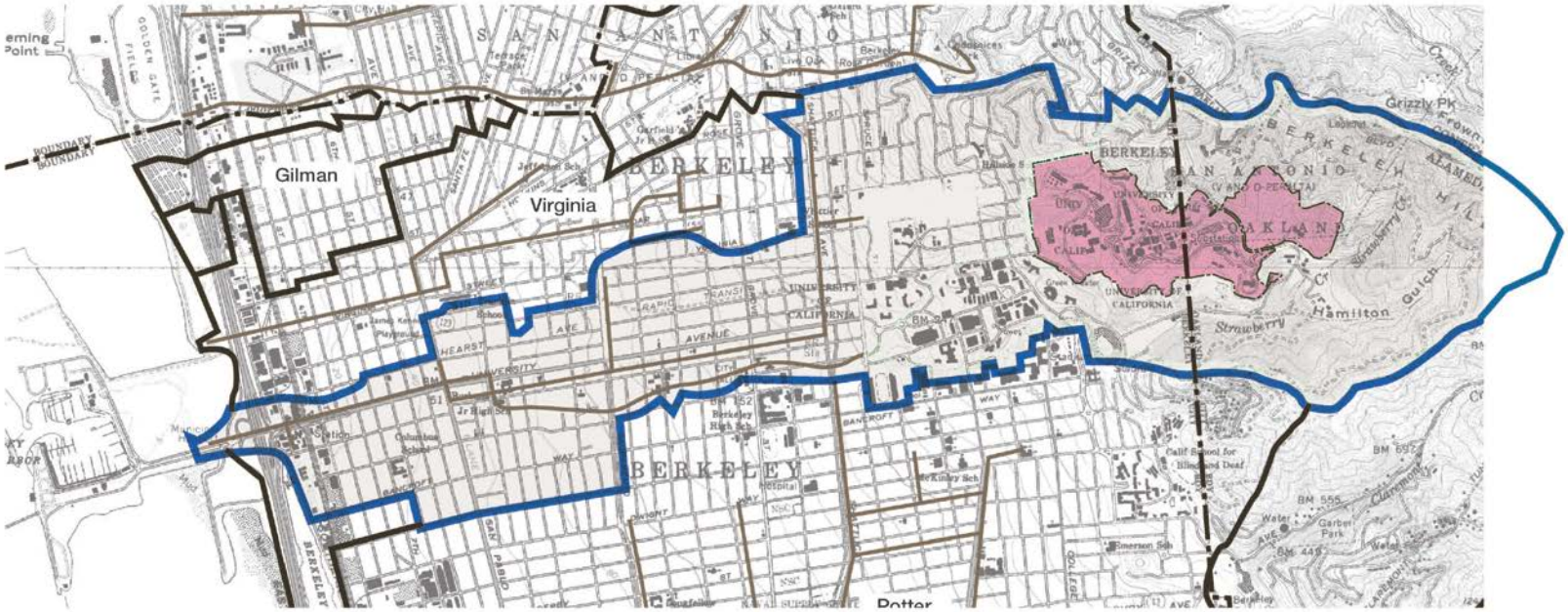
UC Stadium


SYMBOL KEY
UC Stadium
LBNL Boundary
Creek
Berkeley
Oakland
North Fork Strawberry Creek
Cafeteria Creek
Ravine Creek
Tilden Creek
Chicken Creek
No Name Creek
Botanical Garden Creek
Strawberry Creek
Pineapple Creek
Wildcat Creek
SCALE
See Key to Symbols

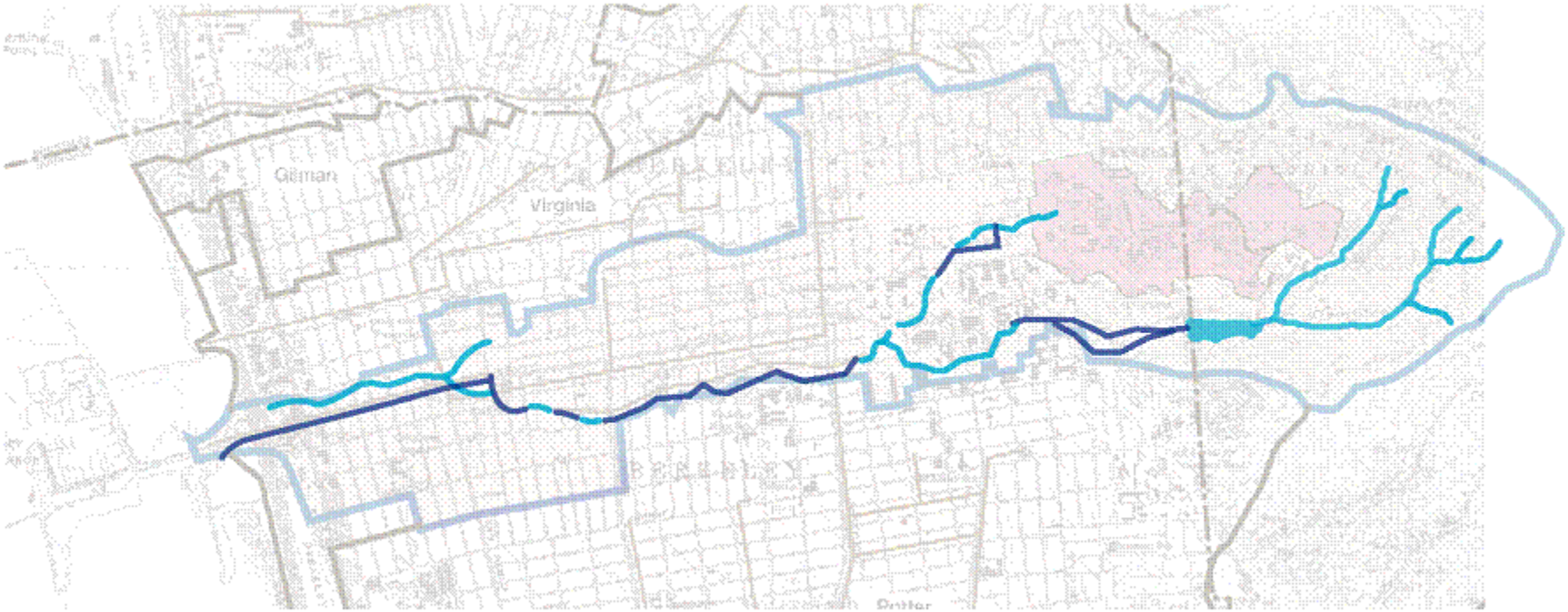
Lawrence Hall of Science



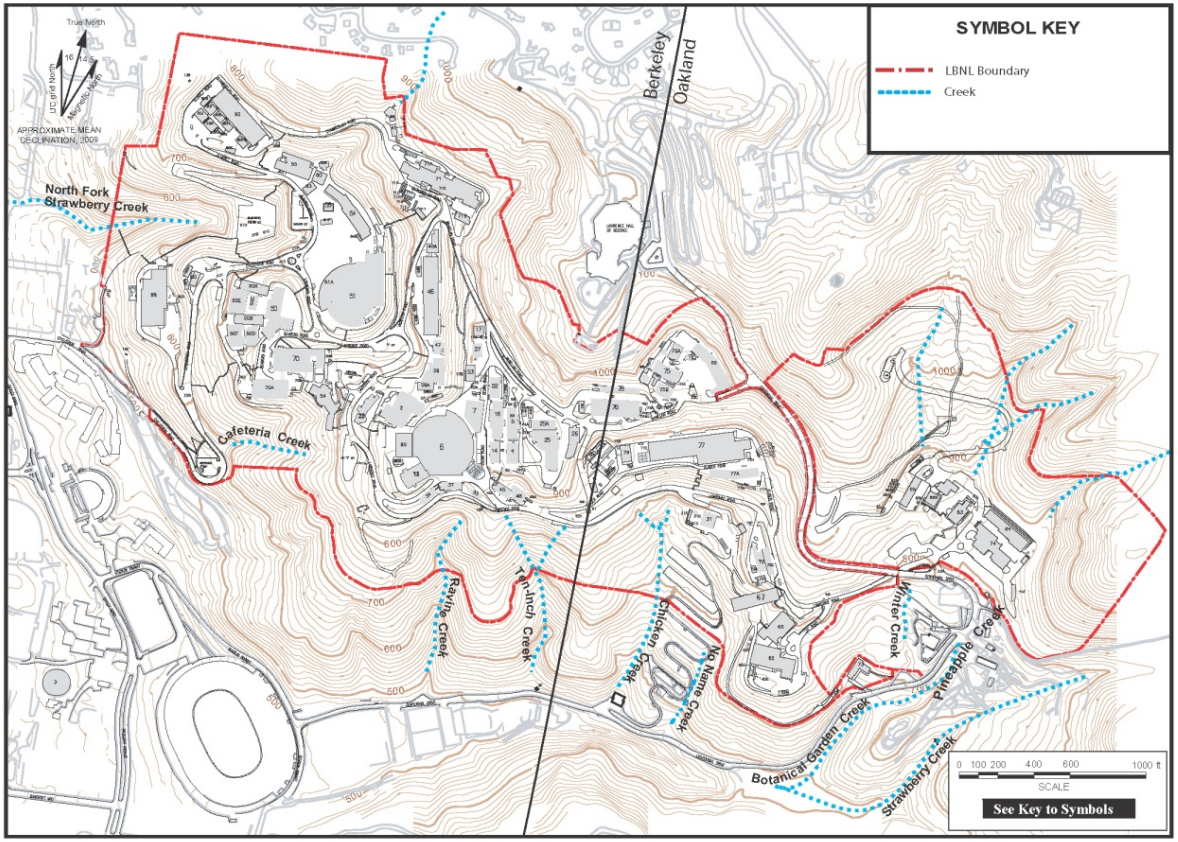
Strawberry Creek Watershed



Strawberry Creek Watershed



Perennial Creeks, Intermittent and Ephemeral Creeks

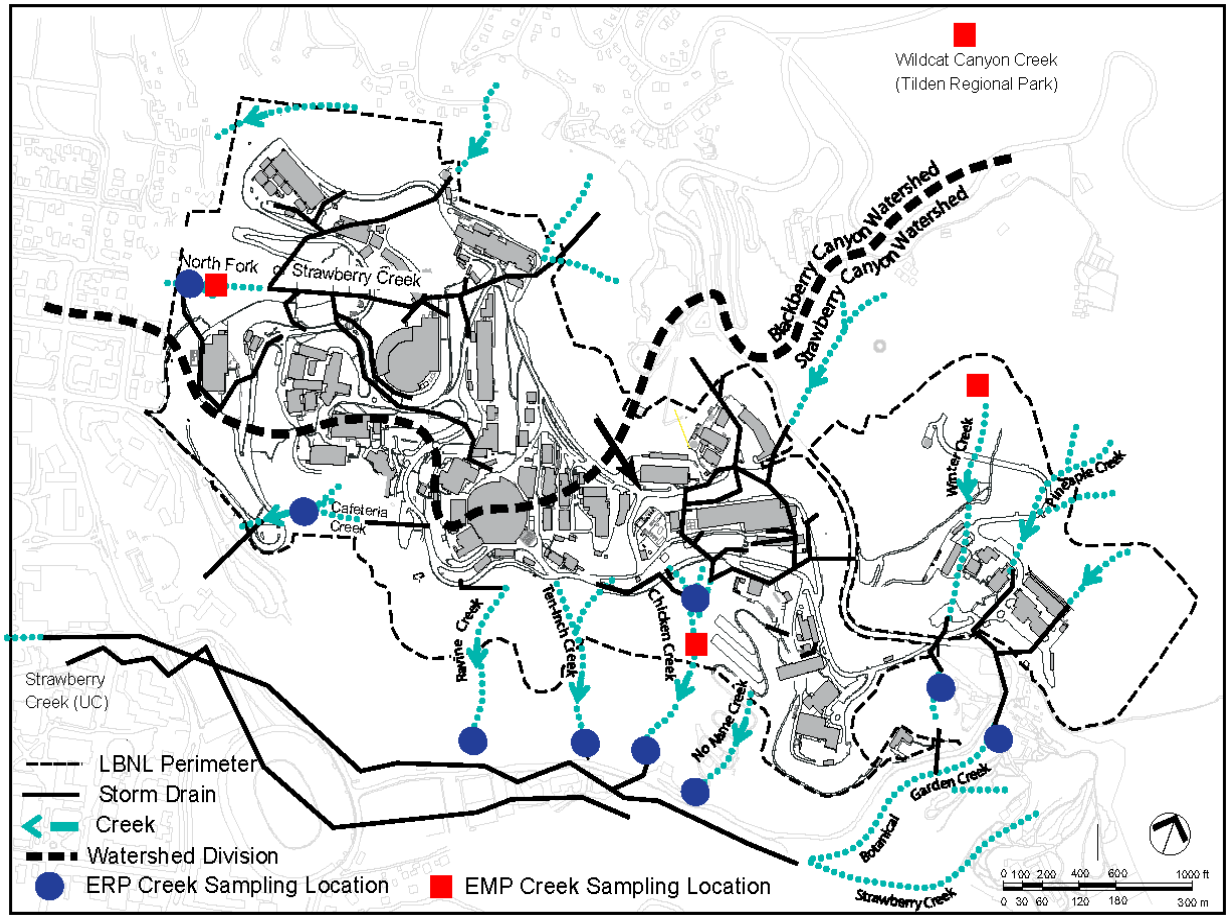


LBNL Facility Setting

Summary Conditions at Berkeley Lab

- 200 acres of steep, generally southern- and western-facing hillside terrain at elevations of 450 to 1,000 feet above sea level
- Rainfall has a seasonal average of nearly 30.5 inches, record of 59.7 inches of rain in 97-98.
- Approximately 35% of the site is impervious acreage, thus 65% remains open space (mainly steep hillside with grass vegetation)

Creek Sampling Locations



Creek Sampling Measurements

What do we measure

- Total Recoverable Metals: **Aluminum, Copper, Iron, Magnesium, Mercury, Lead, and Zinc**
- **Dissolved Metals: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc**
- **pH**
- **Conductivity**
- **Total Suspended Solids**
- **Nitrate + Nitrite**
- **Chemical Oxygen Demand (COD)**
- **Volatile Organic Compounds (VOC)**
- **Tritium**
- **Gross Alpha and Gross Beta**
- **Gamma Spec**

Creek Sampling Results

Winters Creek (run-on location)

Constituent	Measured Range	Water Quality Objectives SF Bay Basin Plan	Stormwater Benchmark (MSGP 2008)	Drinking Water Guidelines (US EPA)
Total Recoverable Metals (mg/L)				
Aluminum	0.25 to 5.0	1	0.75	0.25 to 5.0
Copper	ND	1	0.0636	1.3
Magnesium	21 to 54	NA	0.064	NA
Lead	ND	0.05	0.082	0.015
Mercury	ND	0.002	0.0014	0.002
Iron	0.41 to 5.8	0.3	1.0	0.3
Zinc	ND	5	0.117	5
Dissolved Metals ((µg/L) , 2011)				
Arsenic	ND to 3.9	50	168.54	10
Barium	ND to 70	1000	None	2000
Lead	ND to 1.8	50	82	15
Selenium	ND to 2	50	5	50
Zinc	ND to 17	5000	0.117	5000

MSGP 2008: EPA‘s Multi- Sector General Permit

Creek Sampling Results

Winters Creek (run-on location)

Constituent	Measured Range (mg/L)	Water Quality Objectives SF Bay Basin Plan	Stormwater Benchmark (MSGP 2008)	Drinking Water Guidelines (US EPA)
pH (standard Units)	7.46 to 8.55	6.5 to 8.0	6.0 to 9.0	6.5-8.5
Conductivity (µmhos/cm)	529 to 1045	900	NA	NA
Total Suspended Solids	11 to 71	NA	100	500 (TDS)
Nitrate + Nitrite	ND to 0.21	10	0.68	10+ 1
Chemical Oxygen Demand	ND to 32	NA	120	NA
Volatile Organic Compounds	Non-Detect	Very detailed list	None	Very detailed list
Tritium (pCi/L)	84.1 to 89.0	20,000	None	20,000
Gross Alpha Particle Activity (pCi/L)	0.4	15	None	15
Gross Beta Particle Activity(pCi/L)	0.5	50	None	NA

Creek Sampling Results

North Fork of Strawberry (effluent location)

Constituent	Measured Range (mg/L)	Water Quality Objectives SF Bay Basin Plan	Stormwater Benchmark (MSGP 2008)	Drinking Water Guidelines (US EPA)
Total Recoverable Metals				
Aluminum	0.1 to 1.4	1	0.75	0.25 to 5.0
Copper	ND	1	0.0636	1.3
Magnesium	16 to 32	NA	0.064	NA
Lead	ND	0.05	0.082	0.015
Mercury	ND	0.002	0.0014	0.002
Iron	0.1 to 1.8	0.3	1.0	0.3
Zinc	0.07	5	0.117	5
Dissolved Metals ((µg/L) , 2011)				
Arsenic	ND to 3.9	50	168.54	10
Barium	ND to 78	1000	None	2000
Selenium	ND to 2.9	50	5	50
Vanadium	ND to 11	None	None	None
Zinc	ND to 17	5000	0.117	5000

Creek Sampling Results

North Fork of Strawberry (effluent location)

Constituent	Measured Range (mg/L)	Water Quality Objectives SF Bay Basin Plan	Stormwater Benchmark (MSGP 2008)	Drinking Water Guidelines (US EPA)
pH (standard Units)	8.18 to 8.8	6.5 to 8.0	6.0 to 9.0	6.5-8.5
Conductivity (µmhos/cm)	373 to 694	900	NA	NA
Total Suspended Solids	2 to 72	NA	100	500 (TDS)
Nitrate + Nitrite	0.21 to 0.95	10	0.68	10+ 1
Chemical Oxygen Demand	ND to 35	NA	120	NA
Volatile Organic Compounds	ND	Very detailed list	None	Very detailed list
Tritium (pCi/L)	ND	20,000	None	20,000
Gross Alpha Particle Activity (pCi/L)	ND to 4.2	15	None	15
Gross Beta Particle Activity(pCi/L)	ND to 5.1	50	None	NA

Creek Sampling Results

Regulatory Background

LBNL site is regulated by the Industrial General Permit.

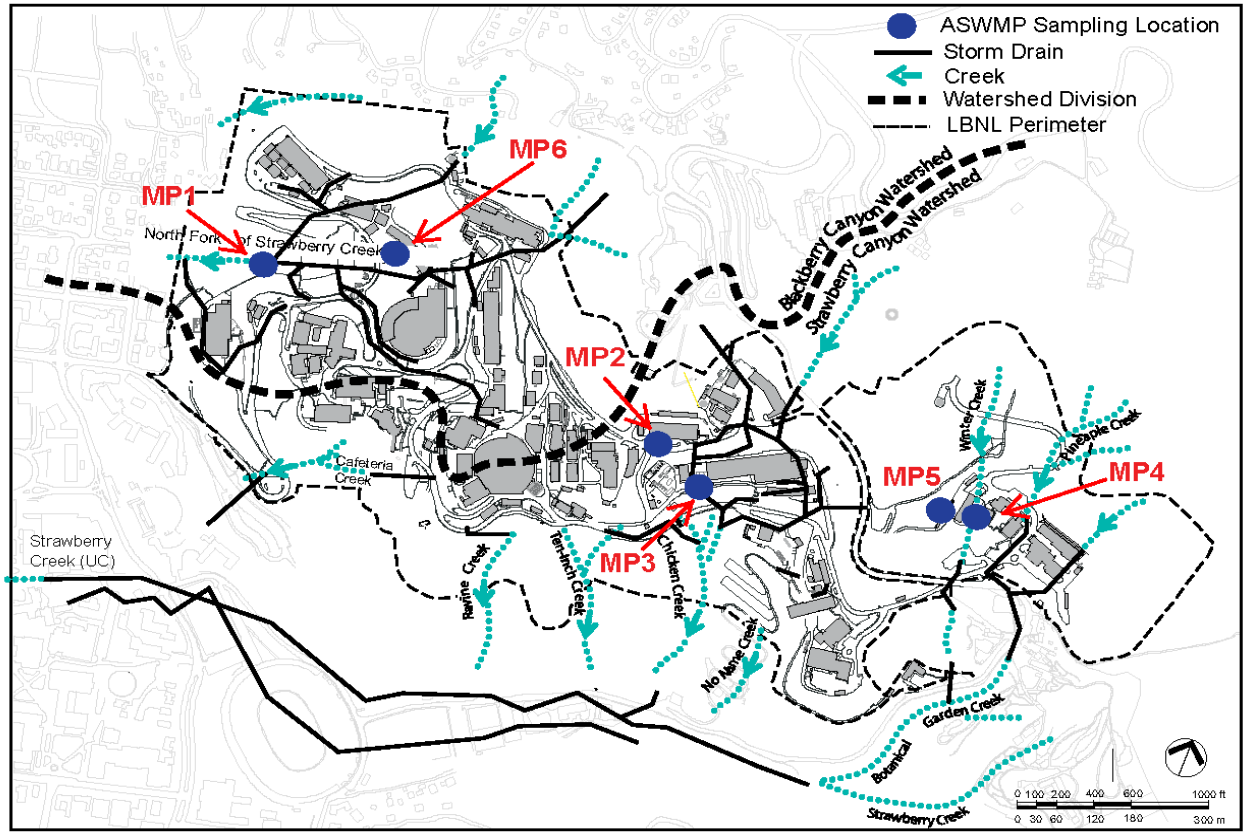
Features of the Industrial General Permit

- Stormwater Pollution Prevention Plan (SWPPP)
- Alternative Stormwater Monitoring Program (ASWMP).
- Monitoring twice per stormwater season, also called the “wet season” (October 1 – May 31st)
- Visual observations
- Inspections (Weekly, Monthly, Annual)
- Employee training
- Submission of Annual report

- LBNL requests a **Construction General Permit** when construction activity takes place in excess of 1 acre of disturbed land (more further on).

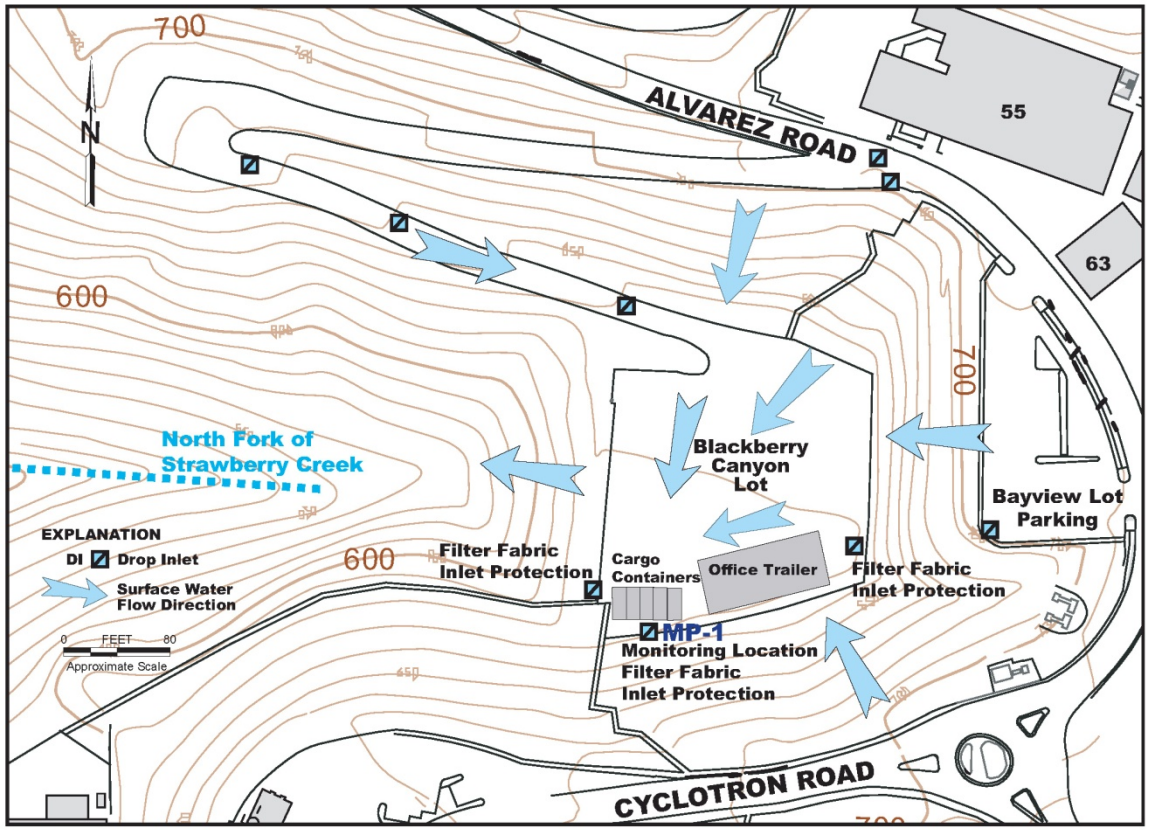
Industrial Locations

Currently there are **five industrial areas** sampled



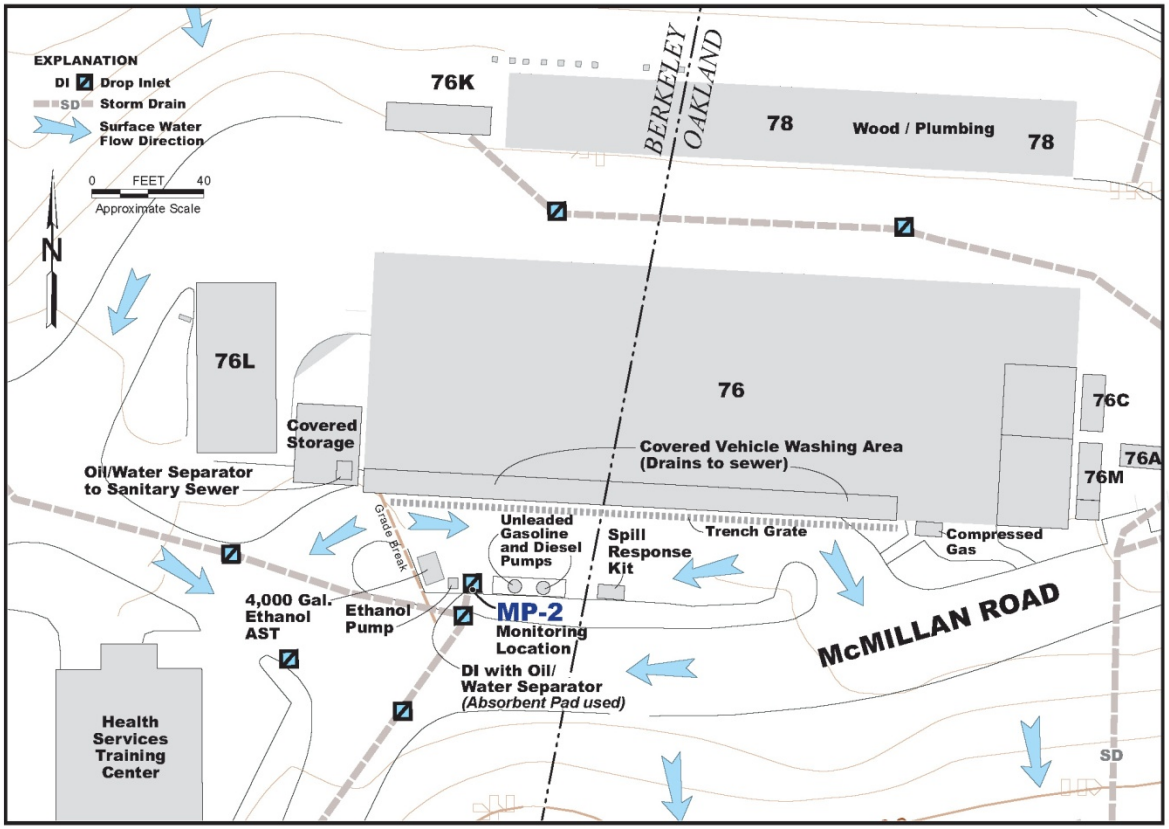
Industrial Locations

Blackberry Parking Lot (former bus parking, MP-1)



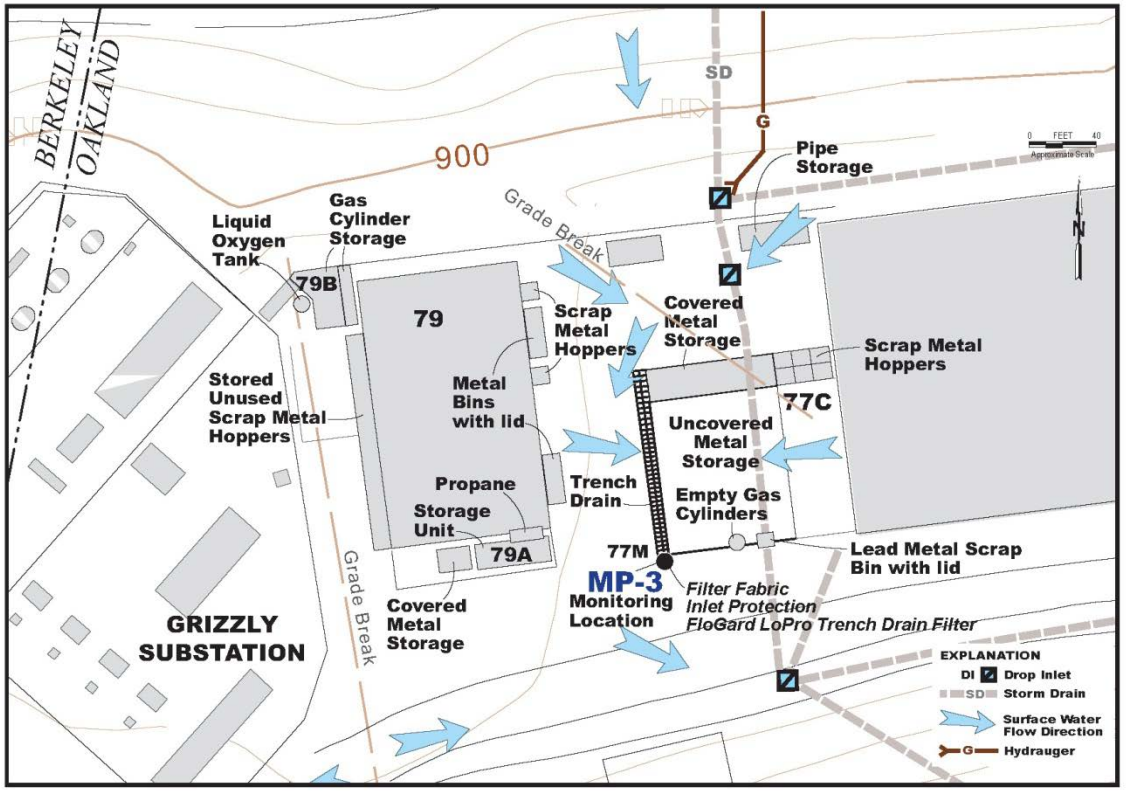
Industrial Locations

Building 76, Vehicle Fueling, (MP-2)



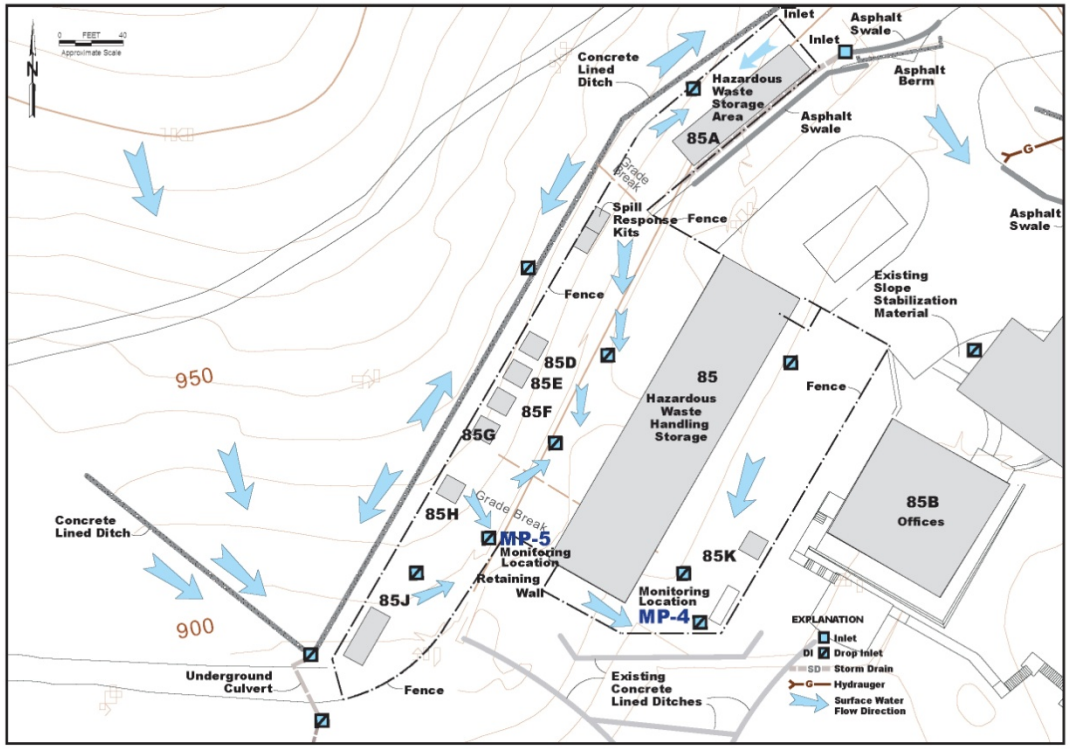
Industrial Locations

Building 77-79, Metal Fabrication Storage and Recycling (MP-3)



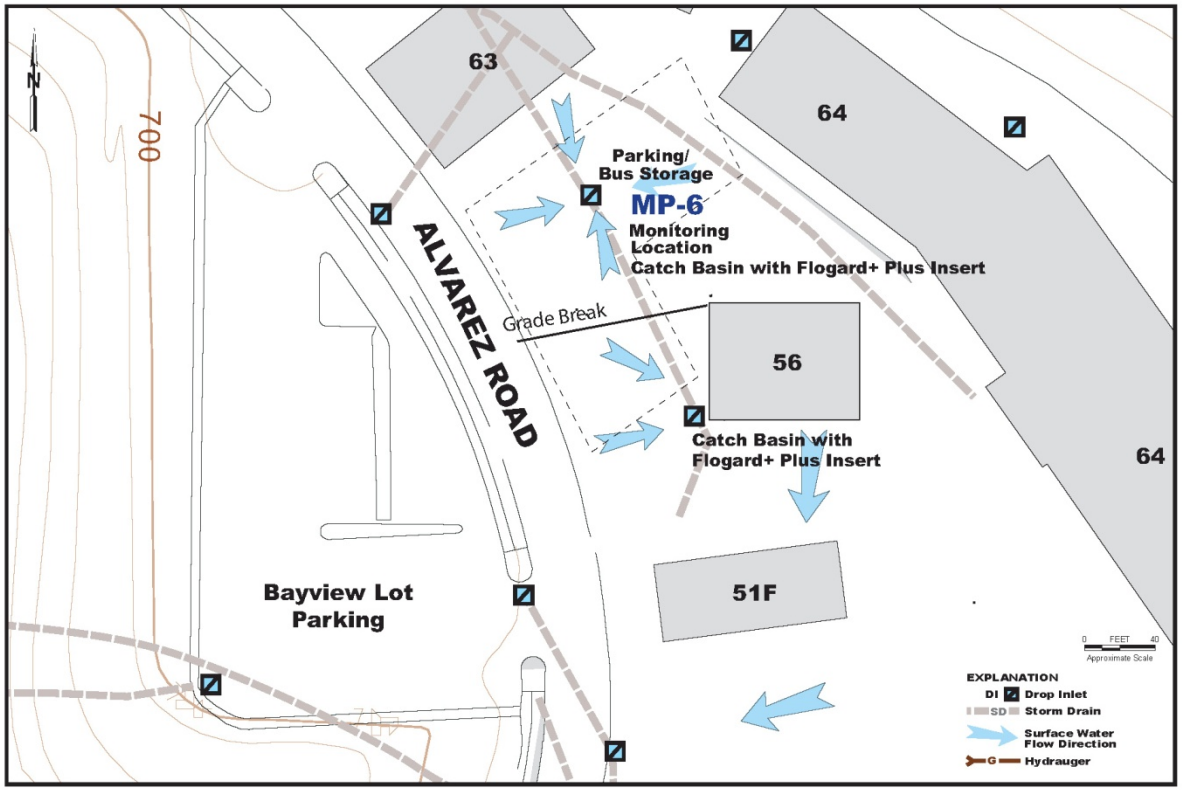
Industrial Locations

Building 85, Hazardous Waste Handling Facility (MP-4 (lower yard) and MP-5 (upper yard))



Industrial Locations

Building 64, Bus Parking and Bio-diesel Fueling (MP-6)



Industrial Area Measurements

SIC Code Determines what to sample

Measurement	Location
pH	All (MP1 thru MP6)
Oil & Grease	All (MP1 thru MP6)
Total Suspended Solids	All (MP1 thru MP6)
Specific Conductance	All (MP1 thru MP6)
Nitrite + Nitrate (as N)	MP3
Aluminum, Copper, Iron, Lead & Zinc	MP3
Chemical Oxygen Demand	MP3, MP4 & MP5
Total Ammonia	MP4 & MP5
Arsenic, Cadmium, Cyanide , Lead, Magnesium, Mercury , Selenium, & Silver	MP4 & MP5

Industrial Area Results (example)

Metal Fabrication Storage and Recycling Facility

Analysis	Units	Reporting Limit	Benchmark	MP3 Metal Rack				B77	
				2/6/09	5/1/09	10/13/09	5/10/10	11/19/10	5/16/11
pH	pH	0.01	6.00-9.00	7.49	7.37	8.27	6.78	7.35	7.84
Conductivity	µmhos/cm	1	NA	67.4	89	37	50	42	48
TSS	mg/l	1	100	99	33	83	38	15	33
Oil & Grease	mg/l	5	15	18	ND	ND	6.32	7.17	ND
NO3+NO2(as N)	mg/l	0.10	0.68	0.37	0.76	0.37	0.21	0.35	0.26
Aluminum	mg/l	0.05	0.75	2.2	0.78	2.2	0.52	0.93	0.51
Iron	mg/l	0.05	1.00	4.5	1.8	4.6	0.78	1.1	0.77
Zinc	mg/l	0.05	0.12	0.73	0.84	0.91	0.4	0.18	0.32
Copper	mg/l	0.05	0.06	NA	NA	0.1	0.1	0.029	0.042
Lead	mg/l	0.05	0.08	NA	NA	0.067	0.023	0.0081	0.015
Chemical Oxygen Demand	mg/l	25	120	NA	NA	83	70	29	46

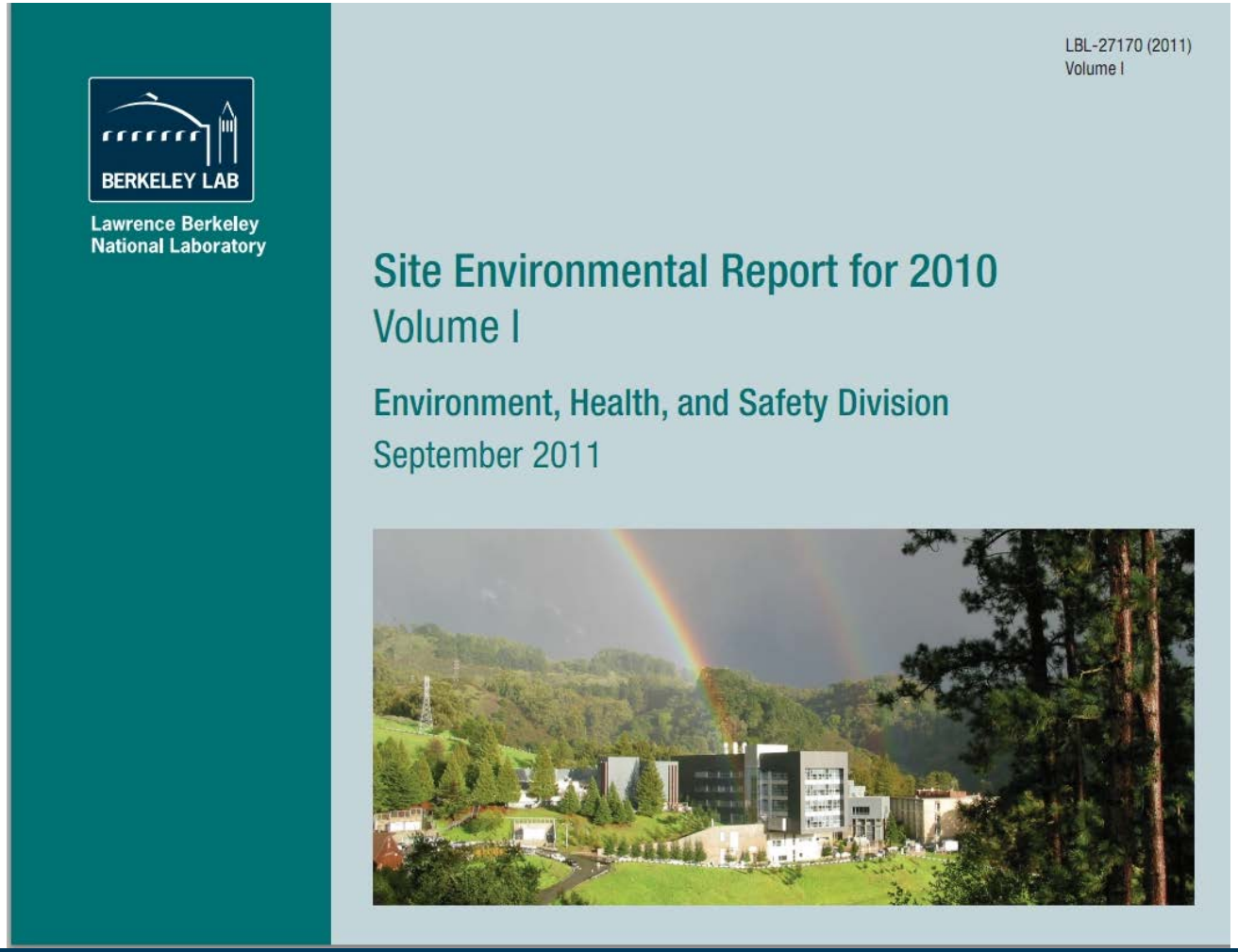
Industrial Area Results (example)

Hazardous Waste Handling Facility

Analysis	Units	Reporting Limit	Benchmark	MP4		B85 Lower Yard				MP5		B85 Upper Yard			
				2/6/09	5/1/09	10/13/09	5/10/10	11/19/10	5/16/11	2/6/09	5/1/09	10/13/09	5/10/10	11/19/10	5/16/11
pH	pH	0.01	6.00-9.00	7.75	6.74	8.65	6.60	7.60	7.64	7.63	6.89	9.39	6.86	7.25	7.55
Conductivity	µmhos/cm	1	NA	23.3	131	13.5	29	11	40	31.2	88	14.6	20	15	48
TSS	mg/l	1	100	3	70	14	10	21	10	30	54	45	9	6	8
Oil & Grease	mg/l	5	15	ND	ND	ND	ND	7.26	ND	ND	ND	ND	7.3	10.1	ND
Lead	mg/l	0.05	0.08	ND	ND	0.0032	ND	ND	ND	ND	ND	0.0077	ND	ND	ND
Chemical Oxygen Demand	mg/l	25	120	ND	**250**	25	50	10	30	ND	**190**	46	30	13	38
Ammonia (NH3)	mg/l	0.05	19.00	0.13	1.6	ND	0.28	0.45	1.7	0.11	1.3	0.13	0.19	0.38	0.73
Arsenic	mg/l	0.05	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	mg/l	0.01	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide	mg/l	0.005	0.06	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA
Magnesium	mg/l	0.05	0.06	**0.084**	**2.2**	**0.21**	**0.45**	**0.12**	**0.55**	**0.25**	**1.9**	**0.49**	**0.35**	**0.2**	**0.76**
Mercury	mg/l	0.0002	0.0024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	mg/l	0.10	0.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	mg/l	0.01	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note 1: Source of Chemical Oxygen Demand (COD) and Magnesium (Mg) was determined to be the aerial deposition of surroundings soils, based on 95% confidence intervals upper benchmarks was increased to 415 mg/L for COD and 3.8 mg/L for Mg.

Industrial Area Results



Construction Projects Requiring Stormwater Permit

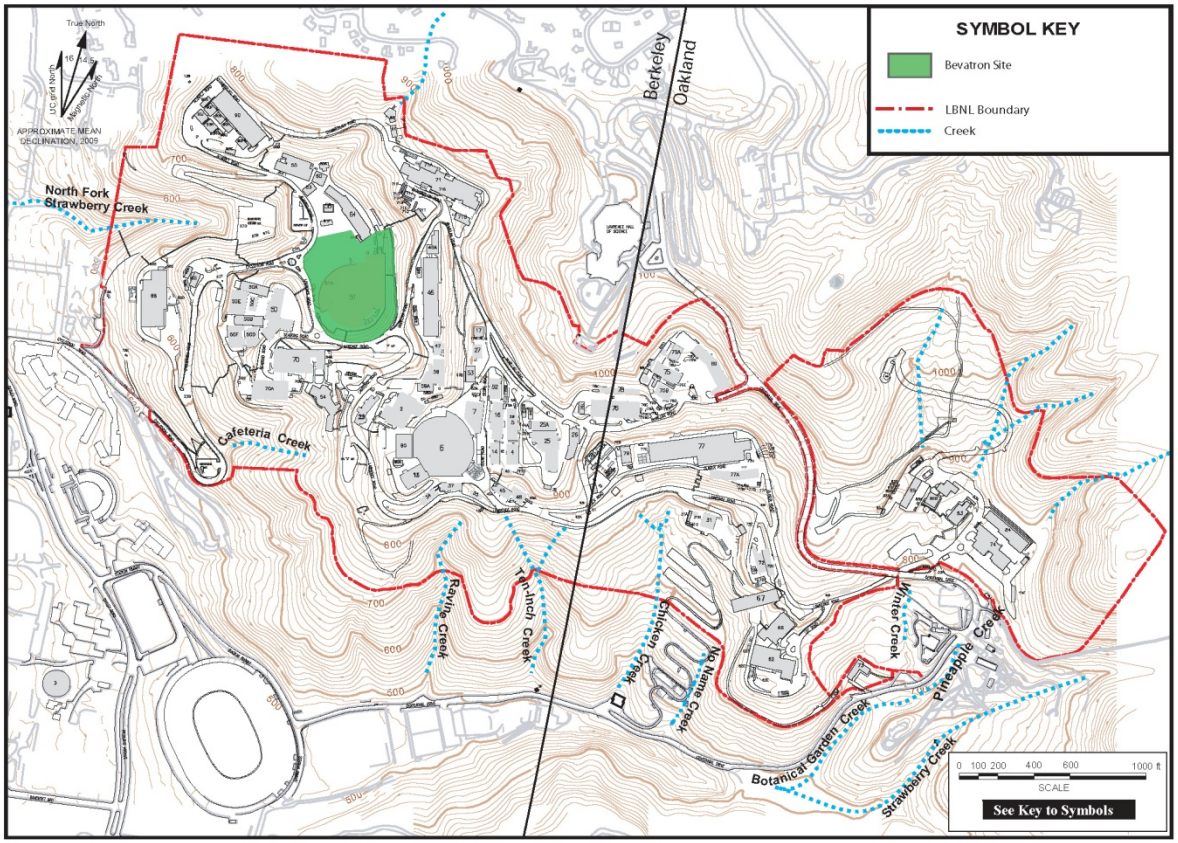
Current Construction Projects:

- Building 51 and Bevatron Demolition Project
- Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase II Project (Seismic Phase II)
- Old Town Demolition and Environmental Restoration

Future Construction Projects:

- UC CRT, Computational Research & Theory Facility
- SERC, Solar Energy Research Center

Building 51 Demolition Project



Seismic Phase II

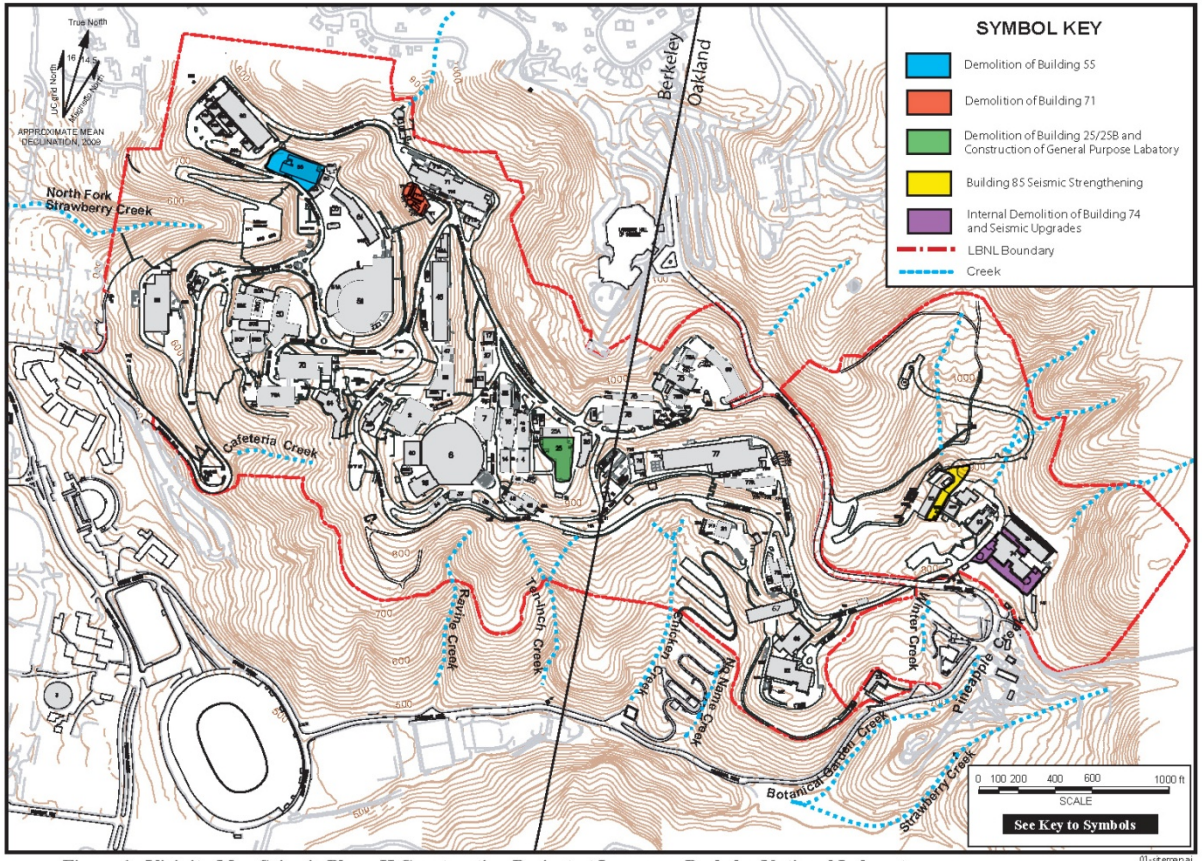


Figure 1. Vicinity Map Seismic Phase II Construction Project at Lawrence Berkeley National Laboratory.

Old Town Demolition and Environmental Restoration

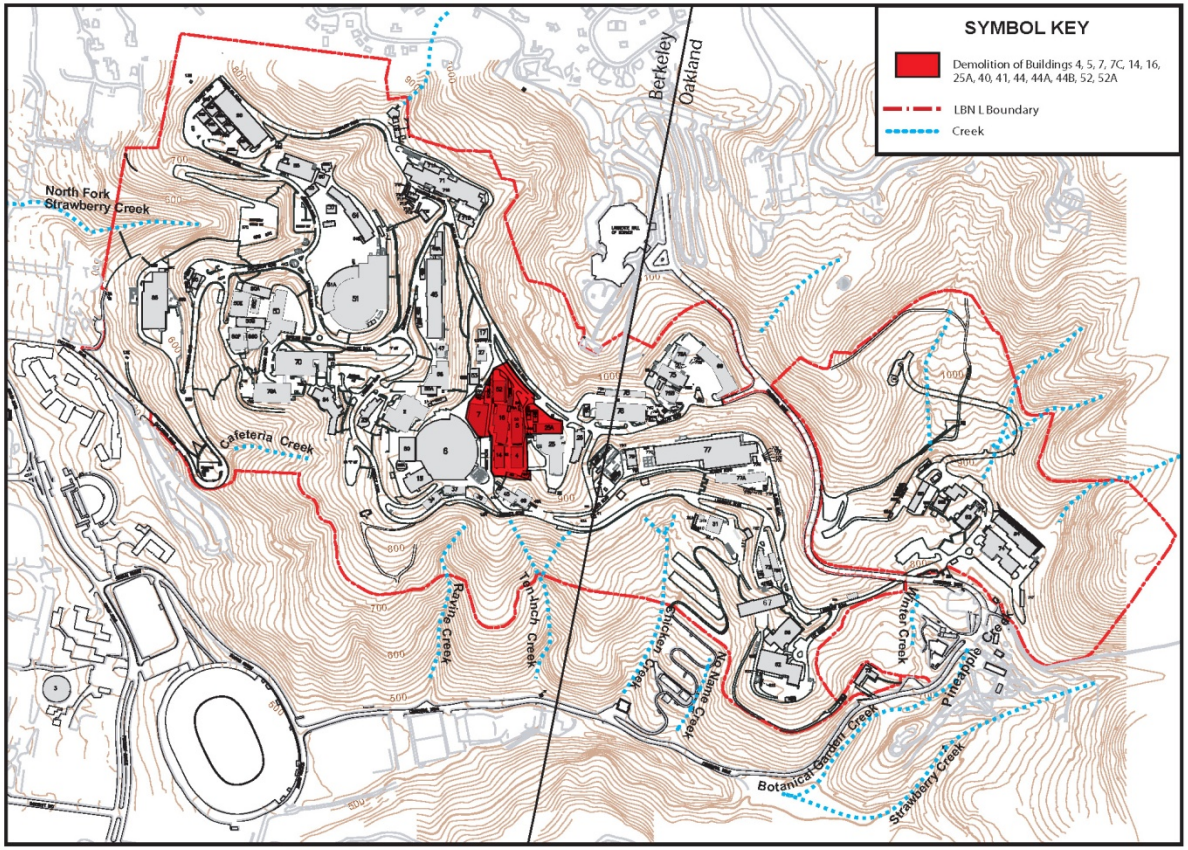
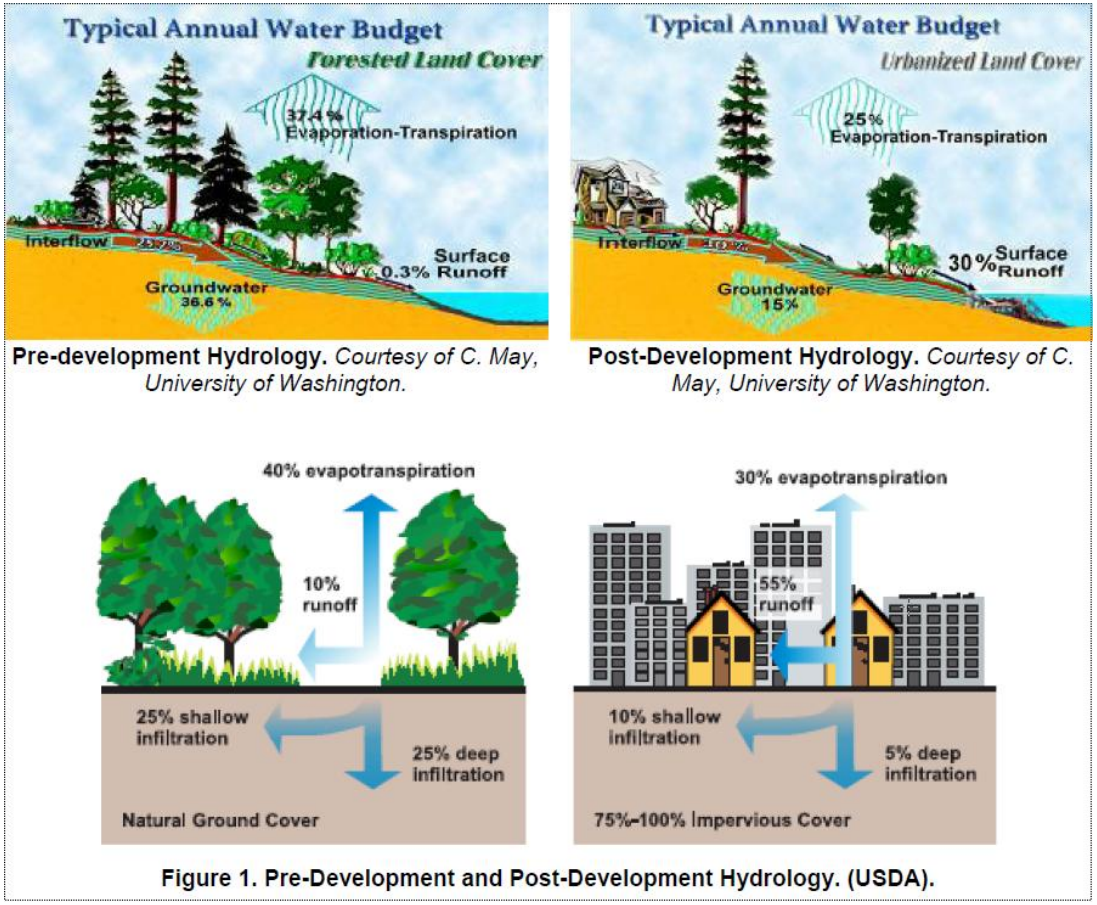


Figure 1. Vicinity Map Old Town Demolition and Environmental Restoration Project at Lawrence Berkeley National Laboratory.

Low Impact Development

- Section 438 of the Energy Independence and Security Act of 2007 (EISA)
  - Section 438 specifically calls for federal developments that exceed 5,000 square feet to maintain or restore **pre-development hydrology.**
- Post-construction requirements under Construction General Permit
  - Replicate the **pre-project** water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event
- LEED credits
  - Stormwater Credits for Quality and Quantity

Low Impact Development



Pre-development Hydrology. *Courtesy of C. May, University of Washington.*

Post-Development Hydrology. *Courtesy of C. May, University of Washington.*

Figure 1. Pre-Development and Post-Development Hydrology. (USDA).

Low Impact Development

Low Impact Development

Low Impact Development

University of California Winter Creek Stabilization and Enhancement Project

Questions