MONITORING

6. MONITORING

A. INTRODUCTION

As discussed in Chapter 2, Compton Creek has existing beneficial use designations for recreation, groundwater recharge, wildlife habitat, warm freshwater habitat, and wetland habitat (Table 2-4). It is also designated as impaired from copper, lead, coliform, and high pH. This chapter evaluates past and current monitoring efforts within the Watershed, identifies any data gaps that should be addressed in future monitoring efforts, and proposes a monitoring program to measure improvements in water quality, monitor habitat, and protect beneficial uses. This monitoring program is not required, but is recommended in order to have complete screening data on which to base future planning and restoration efforts. The monitoring proposed is quite extensive and also recommends involvement from specific agencies that have jurisdiction in a large portion of the Watershed. However it is fully recognized that any expansion of existing monitoring programs is subject to available resources and priorities of these agencies. The program presented is an "ideal" program, which may be scaled back by reducing the frequency or the number of monitoring locations, according to available resources.

B. EXISTING MONITORING

Water quality monitoring has occurred in the Compton Creek Watershed on an irregular basis since 1974. These efforts have been infrequent and limited both in geographic scope and in the scope of constituents monitored, thus do not provide conclusive information about Watershed health, water quality, native flora and fauna, or the sources of contaminants. Most sampling has been conducted just upstream of the confluence with the Los Angeles River, near Del Amo Boulevard.

The LARWQCB has conducted most of its sampling at the downstream end of the Watershed, except in 1987 and 1988 when organics were sampled at two upstream locations. Four organics were detected at low levels on one occasion each: toluene in 1991, dibromochloromethane in 1988, and PCE and 1,2-dichloroethylene in 1987. Figure 6-1 shows types of water quality constituents tested for by the LARWQCB during the years 1974–97, and the number of samples for each.

In addition to the LARWQCB sampling, LACDPW led a one-time sampling effort at eight locations on October 6, 2003. One site, just above the confluence, was an in-stream sample. The remaining sample locations were storm drain inlets, and one of these may have been

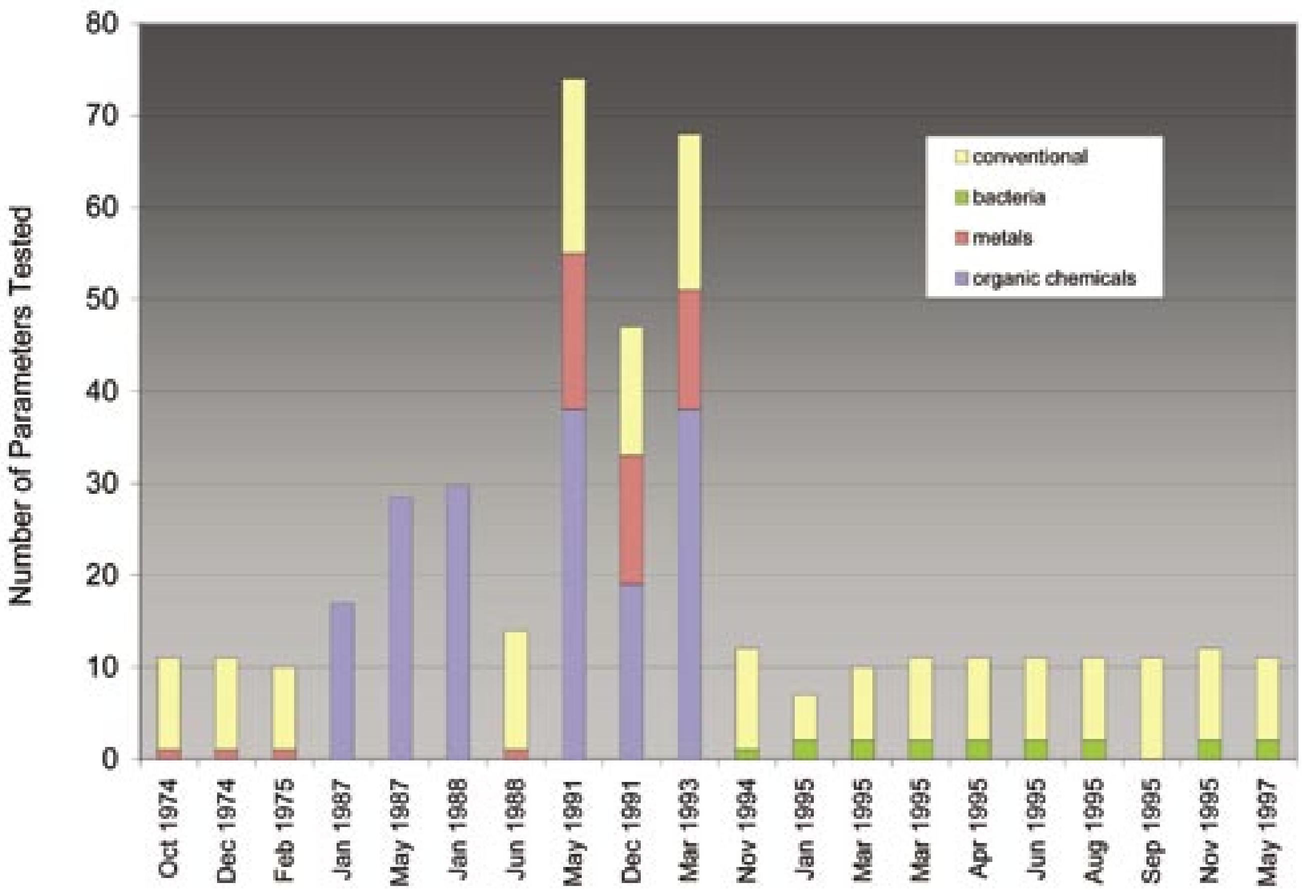

Figure 6-1 Water Quality Parameters Tested in Compton Creek (1974–97)
Source: Los Angeles Regional Water Quality Control Board

influenced by a water main break upstream. Constituents sampled included conventional chemistry, bacteria, and limited metals. Results indicate higher concentrations of copper from storm drain inlets than from in-stream samples taken by the LARWQCB. Concentrations of total coliform bacteria were also higher at some storm drain locations than is typically found in the Creek.

The City of Los Angeles Watershed Protection Division currently conducts monthly sampling in the Creek at Del Amo Blvd., and has sampled for bacteria since January 2002 and metals since January 2005. Just upstream of Del Amo Blvd., FoLAR's Riverwatch volunteer program has sampled conventional parameters mostly monthly since 2003, quarterly sampling of bacteria, and occasional sampling of metals. Most of these data have not yet been released. The SWRCB's Surface Water Ambient Monitoring Program (SWAMP) conducts monitoring in the Los Angeles River Watershed on a five year cycle, with water quality sampling (conventional parameters, metals, pesticides, and toxicity) and bioassessment conducted at one point in Compton Creek in late spring 2005.

These sampling locations and parameters sampled are depicted on Figures 6-2 and 6-3, with the exception of the SWAMP sampling. LASGRWC also conducted limited native vegetation mapping in the earthen-bottom portion of Compton Creek in 2002.

C. MONITORING PROGRAM GOALS

For constituents listed on the 303(d) list, existing monitoring is probably adequate to assess whether water quality objectives are being met during dry weather. However it does not include any watershed assessment to determine the source of existing impairments. These programs also do not evaluate whether conditions are improving (or not), do not assess whether other constituents entering the Creek are impairing beneficial use designations for recreation and habitat, or the potential impacts of water quality on the success of future restoration efforts. To improve water quality, monitor habitat and native flora and fauna, and protect beneficial uses, six objectives and related actions are proposed, as shown in Table 6-1. Program goals and parameters to be sampled were developed with assistance from the Compton Creek Watershed Management Plan Steering Committee.

The last goal is not addressed in detail below as it is not known at this point when or by whom projects will be completed. As projects are implemented that incorporate BMPs for water quality treatment or runoff reduction, the effectiveness of the BMPs should be assessed to determine potential water quality impacts. This may help to interpret results of the monitoring program and inform decisions about future project planning and design.

Table 6-1 Compton Creek Monitoring Program Goals and Actions

Monitoring Objective	*Recommended Action*
Assess Overall Watershed Health	**Water Quality**: 2 year watershed-wide assessment **Mapping:** native flora, storm drain outlets, and dump sites **Fauna**: Biannual bird surveys Annual amphibian surveys Annual benthic macro-invertebrate surveys
Fill in data gaps in existing monitoring	Expand parameters, locations and frequency of monitoring
Determine if Water Quality Objectives are being met and Beneficial Uses protected	2-year watershed-wide wet- and dry-weather water quality sampling for constituents of concern
Identify subwatersheds that are significant sources of pollution	Monthly sampling at selected storm drain locations that isolate subwatershed drainage areas
Expand community involvement in monitoring	Involve community in all aspects of monitoring program while maintaining data quality. Make data readily available to the public.
Monitor the effectiveness of pilot BMP projects, as projects are completed	Visually inspect BMP projects Include water quality monitoring of BMP installation site where appropriate

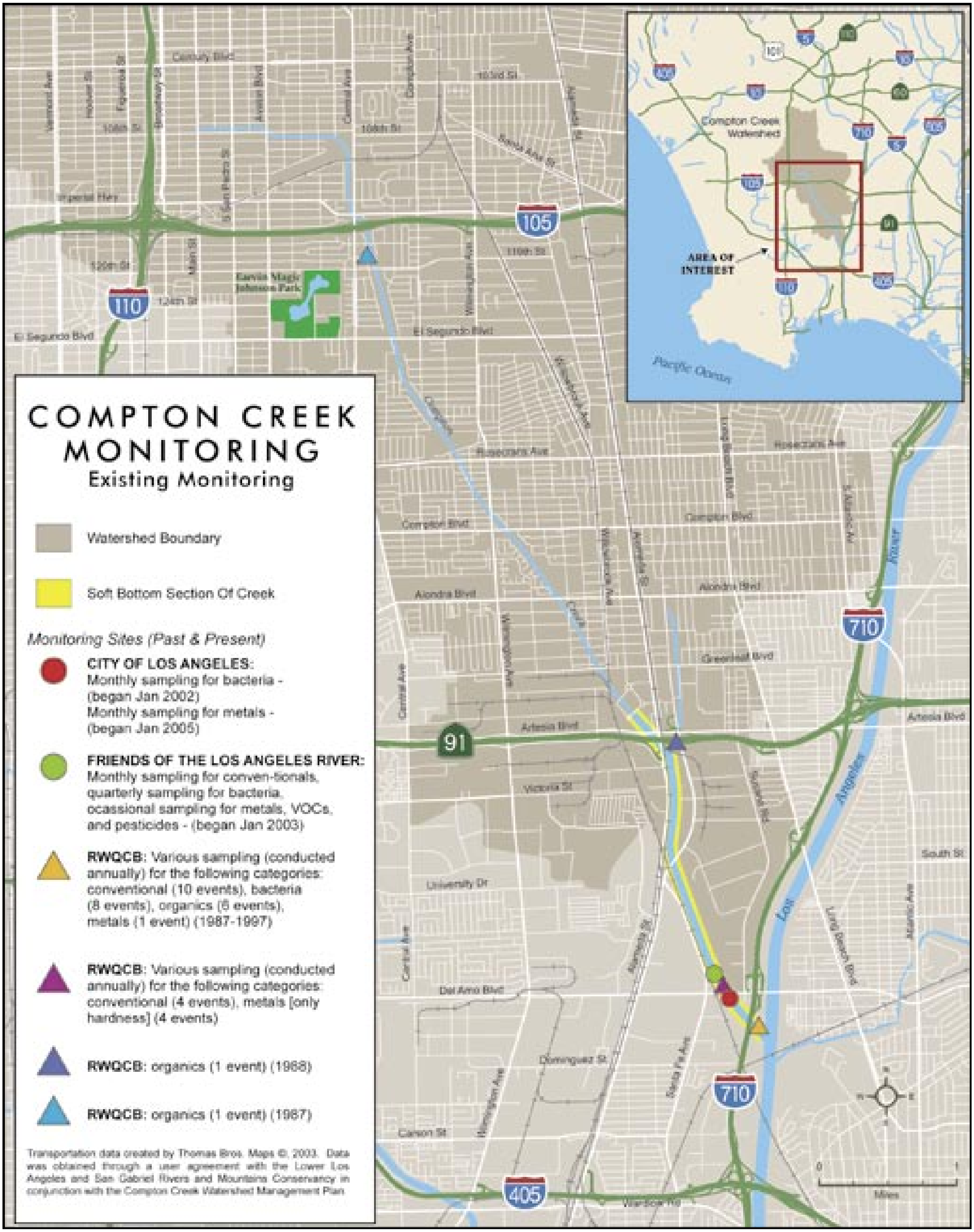

Figure 6-2 Existing Monitoring Locations in Compton Creek Watershed
Source: Los Angeles & San Gabriel Rivers Watershed Council

Figure 6-3 LACDPW Monitoring Locations in Compton Creek Watershed
Source: Los Angeles & San Gabriel Rivers Watershed Council

D. PROPOSED MONITORING PROGRAM

To address data gaps in existing monitoring, it is recommended that the Compton Creek Watershed undergo a complete watershed assessment that includes water and sediment quality, habitat, and biological monitoring. This monitoring program is designed to support the monitoring objectives described above and to definitively provide the information necessary to detail the current water quality and biological health of the Watershed. The monitoring program will also provide the data necessary to identify watershed areas that contribute to existing impairments and prioritize pilot BMP projects that could target these areas. These data will provide decision makers with the ability to create a watershed-wide restoration program that addresses the sources of pollutants and water quality and habitat degradation problems identified during the course of the watershed assessment. The program should also involve and educate the community.

It is recommended that a citizen volunteer monitoring program be undertaken in the Watershed. This program should engage the local communities and stakeholders of the Watershed. Additionally, entities such as County of Los Angeles, Watershed cities, the LARWQCB, and the USACE could potentially contribute monitoring or monetary resources to complete this watershed assessment. The monitoring program envisioned will contain the following components:

- Monthly water chemistry monitoring at nine locations along the Creek, including sediment sampling
- Wet and dry weather sampling
- Installation of a flow monitoring device at the bottom of the watershed to calculate total pollutant loads in wet and dry weather
- Monthly trash surveys at all monitoring locations
- Annual stream habitat assessment and mapping. Will include illegal dumping sites and trash mapping, algae impairment mapping, homeless encampment mapping, presence/ absence of amphibians and other wildlife
- Biannual bird surveys (winter and spring)
- Annual benthic macroinvertebrate sampling at 3 sites in the earthen-bottom portion
- One time comprehensive native vegetation mapping of earthen-bottom portion with field botanist
- One time mapping of storm drain outlets

In order to facilitate future source assessment and to assist in the selection of potential water quality monitoring locations, LASGRWC and Heal the Bay have mapped subwatershed areas that drain into Compton Creek (Figure 6-4) and identified the predominant land use in each drainage area.

1. Water Quality Monitoring

A full and thorough water quality assessment should be conducted to assess the health of the Watershed and determine whether beneficial uses are being protected. Ideally, a two year intensive water quality screening should be conducted during wet and dry weather to accurately characterize existing water quality impairments. At the end of this section, two options are presented for an "optimal" program and "minimal" program. In either case, certain constituents (such as organics) could be dropped from the monitoring suite if they are undetected after several samples. In addition, continuous flow measurements are recommended at the end of the Creek so that total pollutant loads into the Los Angeles River can be assessed.

Costs, methods, and detection limits for laboratory analyses are based on information from CRG Marine Laboratories in Torrance, unless otherwise noted. Labor cost estimates are based on Heal the Bay's experience running similar monitoring programs.

▣ Recommended Parameters for Sampling

Conventional parameters are constituents, observations, or measurements that are generally collected in the field. These items are standard chemical and water quality measurements included in most monitoring programs.

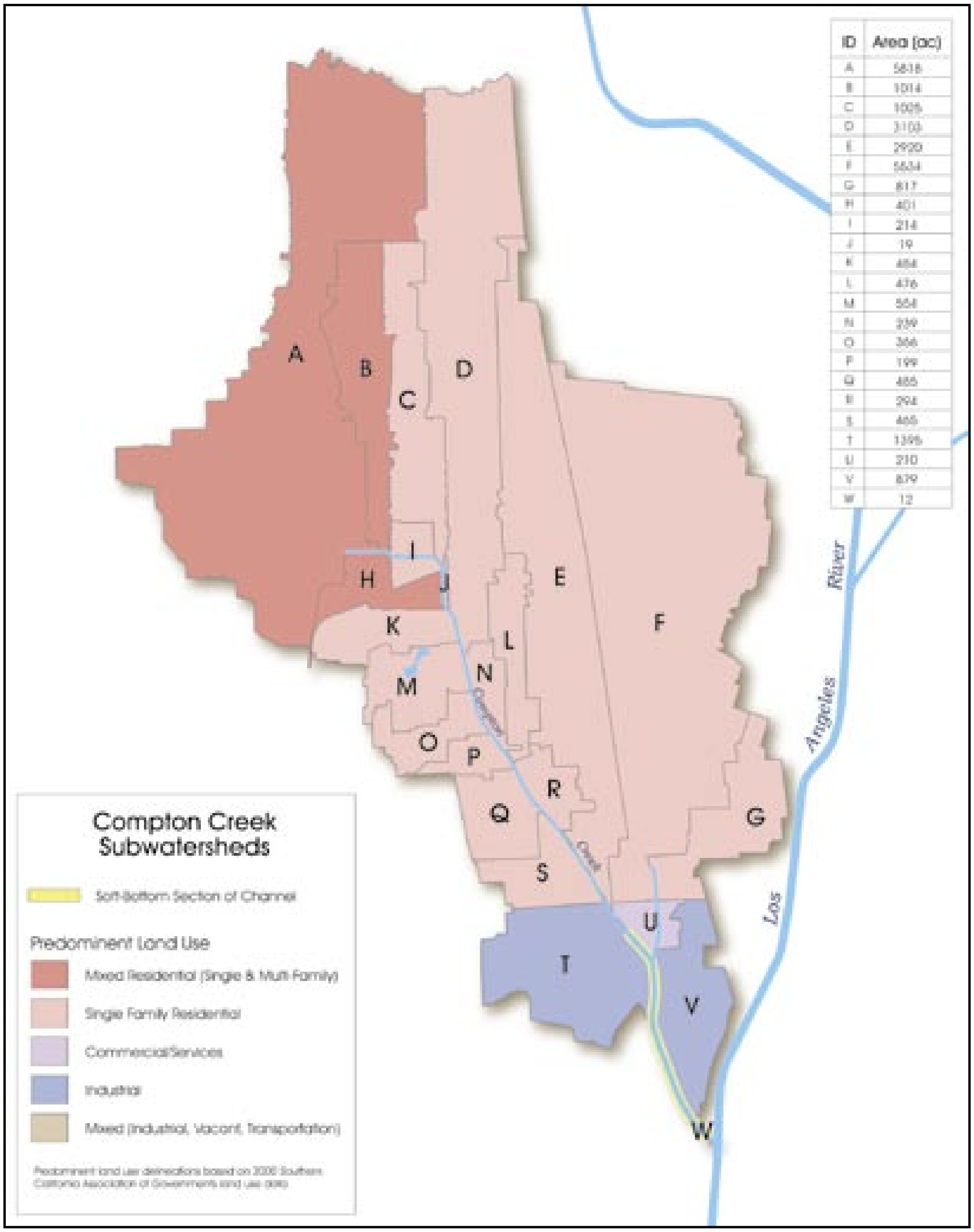

Figure 6-4 Subwatersheds in Compton Creek Watershed
Source: Los Angeles & San Gabriel Rivers Watershed Council and LACDPW

They include weather description, dissolved oxygen, pH, turbidity, conductivity, salinity, algae coverage, stream or storm drain discharge, and trash.

Nutrients

Nutrients, in the context of water quality, generally refer to the available nitrogen and phosphorus in surface waters that can be used for plant growth. Excessive nutrients stimulate algal growth which could negatively impact freshwater and wetland habitats. These problems include less available dissolved oxygen for aquatic life, increased turbidity, and strong odors. Nutrients come from a variety of sources such as fertilizers from agriculture and landscaping, housing of animals and livestock, decaying plant matter, human waste from septic systems, and sewage treatment plants. It is recommended that nutrient monitoring occur in the Creek. Specific testing should include nitrate-nitrite-nitrogen, orthophosphates, and ammonia-nitrogen. Additionally, we recommend using a testing method that will yield results at a level of 0.05 ppm for the nutrient testing. Heal the Bay has seen rapid algal growth when nitrate and/or phosphate inputs exceed levels 0.10 ppm. The Los Angeles River downstream of Compton Creek is listed on the 303(d) list as impaired for algae which may be a result of excess nutrients. It is not known whether Compton Creek is a source of nutrients to the Los Angeles River.

Bacteria

Bacteria contamination can be a serious threat to human health. Fecal coliform bacteria, such as E. coli, and Enterococcus bacteria are indicators that fecal matter from warm blooded animals or human sewage is present in a water body. Compton Creek has REC-1 and REC-2 beneficial uses and is on the 303(d) list as impaired for high coliform counts. Bacteria should continue to be sampled to determine if this Watershed is meeting water quality standards and may be required for future TMDL compliance. Total coliform, E. coli, fecal coliform, and Enterococcus bacteria are recommended for sampling.

Chlorophyll-a

Chlorophyll is the green pigment in plants that absorbs energy from sunlight necessary for photosynthesis. Chlorophyll-a is used as an indicator of algal biomass. Excess nutrients in a creek can lead to excessive growth of algae that will eventually deplete the creek of oxygen necessary to sustain aquatic life. Monitoring Chlorophyll-a will provide data on the general health of the Creek and its capacity to sustain its beneficial uses for habitat.

Hardness

Hardness is the concentration of calcium, magnesium, iron and other metals in water. Hardness can be a useful water quality indicator to determine the impacts of development and resource extraction in a watershed. Hard water requires higher metal concentrations in order to be toxic, and water quality objectives for some metals are hardness-based. Compton Creek is on the 303(d) list for several metals, which could impact beneficial uses for habitat.

Chloride

Chlorides are salts that can enter a watershed in effluent from water softeners, atmospheric deposition, pesticides, fertilizers, and indoor water use (chemicals, cleansers, food, etc.). Chloride levels should be monitored to determine if there is impairment to the fresh water habitat and groundwater recharge beneficial uses.

Metals

Metals are commonly found in urban runoff. Metals are generated from eroding tires, industrial discharges, leaking vehicle fluids, aerial deposition of soot and exhaust that settles onto roads and rooftops from combustion engines. Brake pads and moving metal parts create fine metal shavings that are easily flushed from roads into storm drains. The industrial operations, dense urban land uses, and numerous roads and freeways in the Watershed necessitate monitoring of metals. Additionally, Compton Creek is on the 303(d) list of impaired waterbodies for copper and lead. Table 6-2 illustrates the suite of metals that are recommended for testing in the water column and sediments. Included are EPA method numbers, minimum recommended detection limits, and estimated costs. The EPA methods listed in the table below include all the constituents listed. Many of these constituents have a small likelihood of being present in the Watershed but can be tested for no additional cost as part of the standard laboratory method used to analyze for metals.

Organic Compounds (Organophosphates, Organochlorines, and PAHs)

Organic compounds from pesticides and industrial operations can be highly toxic to humans and aquatic life. Organic compounds can cause cancer, reproductive harm, birth defects, nervous system disorders, and environmental damage. Organophosphates and carbamates are the most frequently used insecticides worldwide. These compounds cause 80% of the reported toxic exposures to insecticides. The term organochlorine refers to a wide range of organic chemicals, which contain chlorine and sometimes several other halogens, often used in herbicides, insecticides, fungicides and industrial chemicals such as polychlorinated biphenyls (PCBs).

Table 6-2 Recommended Metals and Test Method for Water and Sediment

EPA Method 200.8 Water Column	*500 ml plastic only Sample Cost $100*
Riverine & Stormwater	**MDL µg/L (ppb)**
Aluminum (Al)	1
Antimony (Sb)	0.1
Arsenic (As)	0.1
Barium (Ba)	0.1
Beryllium (Be)	0.1
Bismuth (Bi)	5
Boron (B)	1
Bromine (Br)	0.5
Cadmium (Cd)	0.1
Calcium (Ca)	0.1
Cesium (Cs)	0.1
Chromium (Cr)	0.1
Cobalt (Co)	0.1
Copper (Cu)	0.1
Iodine (I)	0.1
Iron (Fe)	1
Lead (Pb)	0.1
Lithium (Li)	0.1
Magnesium (Mg)	1
Manganese (Mn)	0.1
Mercury (Hg)	0.05
Molybdenum (Mo)	0.1
Nickel (Ni)	0.1
Potassium (K)	5
Selenium (Se)	0.1
Silicon (Si)	1
Silver (Ag)	0.1
Sodium (Na)	5
Strontium (Sr)	0.5
Thallium (Tl)	0.1
Tin (Sn)	0.1
Titanium (Ti)	0.1
Vanadium (V)	0.1
Zinc (Zn)	0.1

EPA Method 6020	*50 g in Glass Jar Sample Cost $175*
Sediment	**MDL µg/L (ppb)**
Aluminum (Al)	1
Antimony (Sb)	0.025
Arsenic (As)	0.025
Barium (Ba)	0.025
Beryllium (Be)	0.025
Bismuth (Bi)	0.5
Cadmium (Cd)	0.025
Calcium (Ca)	1
Cesium (Cs)	0.05
Chromium (Cr)	0.025
Cobalt (Co)	0.025
Copper (Cu)	0.025
Iodine (I)	0.05
Iron (Fe)	1
Lead (Pb)	0.025
Lithium (Li)	0.05
Magnesium (Mg)	1
Manganese (Mn)	0.025
Mercury (Hg)	0.005
Methylmercury	0.01
Molybdenum (Mo)	0.025
Nickel (Ni)	0.025
Phosphorus (P)	0.5
Potassium (K)	1
Selenium (Se)	0.025
Silver (Ag)	0.025
Sodium (Na)	1
Strontium (Sr)	0.025
Thallium (Tl)	0.025
Tin (Sn)	0.025
Titanium (Ti)	0.025
Vanadium (V)	0.025
Zinc (Zn)	0.025

Costs: CRG Marine Laboratories

Polycyclic aromatic hydrocarbons (PAHs) are chemicals that are formed as byproducts of combustion (burning) of coal, oil, gas, garbage, tobacco, foods and other organic substances.

The Watershed generates runoff from large areas of residential and industrial land uses. In addition, there are segments of Compton Creek that have nurseries located directly adjacent to the stream channel. For these reasons we recommend collecting ambient water quality data and sediment quality data to determine if organophosphates or organochlorines are present in Compton Creek. Table 6-3 and 6-4 list the suite of constituents that will be measured when testing for organophosphates and organochlorines in both water and sediments, and PAHs in sediments. These constituents have not previously been sampled in the Creek. Organochlorines tend to be found more in sediments, so if they are mostly not detected after the first few rounds of sampling, they could be dropped from water column monitoring.

Toxicity

Existing water quality data provide no information regarding the toxicity of Compton Creek waters and sediment. Since the Creek has several designated beneficial uses for habitat, the primary objective of testing for toxicity is to determine if water and/or sediment in the Creek is harmful to aquatic life, and other species that may consume or have contact with surface waters and/or sediments. This would be a prerequisite to any habitat restoration projects. To test toxicity, organisms are exposed to a collected sample to determine if water or sediment quality is toxic or impacts the growth and survival rates of the test organisms. Since Compton Creek is impaired for metals and receives runoff from industrial operations, dense urban land uses, and freeways, acute and chronic toxicity tests are recommended to determine the impacts, if any, of these constituents. Toxicity testing can be quite expensive, with sediment samples at $500 each and water toxicity at $520 or $995 for one or two organisms, respectively.

Acute Toxicity is the ability of a substance to cause harmful effects to organisms soon after a single exposure or any severe poisonous effect resulting from a single short-term exposure to a toxic substance. Frequently acute toxicity tests have organism death as the measured outcome.

Chronic Toxicity is the effect on organisms subjected to repeated or long-term exposure to a substance. Endpoints in chronic toxicity tests are generally related to growth or reproduction. Organisms are used to estimate toxicity of effluents and receiving waters. Standard methods for various species have been established by several EPA and State Water Resources Control Board field tests. The two species recommended for toxicity testing are the following:

- Fathead minnow, a fish that is used in short-term survival tests
- Ceriodaphnia, a small crustacean found in vernal pools and in freshwater pond and lakes throughout the world. Ceriodaphnia is very sensitive to pesticides, heavy metals, and other toxic substances used by humans and discharged into surface waters

Toxicity Identification Evaluation (TIE) is used to identify the general chemical group and/or constituents that are causing toxicity of the test organisms. It is recommended that TIEs be conducted to determine the chemical cause of the toxicity, if present in test samples.

Volatile/Semi Volatile Organic Compounds and Oxygenates

Compton Creek has a designated beneficial use for groundwater recharge, which can occur within the earthen-bottom section of the Creek. Volatile organic compounds (VOCs) are present in one-fifth of the nation's water supplies. VOCs can enter groundwater from a variety of sources, such as from gas or oil spills, and from leaking underground fuel storage tanks. The gasoline oxygenate, MTBE, is a possible human carcinogen. There are highly urbanized and industrial land uses in the Watershed, numerous streets and freeways, and NPDES permits for a fuel oil facility and a Sta-Lube facility, necessitating the screening of surface waters for VOCs. Although prior sampling by the LARWQCB resulted in very few detections, the constituents sampled were limited and the most recent sampling was conducted in 1993 at a single

Table 6-3 Recommended Constituents and Test Method for Organochlorines

Trace Organic Compounds EPA Method 625	*1 L in Amber Glass Sample Cost $175*
Organochlorine Compounds in Water	**MDL ng/L (pptr)**
2,4'-DDD	1
2,4'-DDE	1
2,4'-DDT	1
4,4'-DDD	1
4,4'-DDE	1
4,4'-DDT	1
Aldrin	1
BHC-alpha	1
BHC-beta	1
BHC-delta	1
BHC-gamma	1
Chlordane-alpha	1
Chlordane-gamma	1
Dieldrin	1
Endosulfan Sulfate	1
Endosulfan-I	1
Endosulfan-II	1
Endrin	1
Endrin Aldehyde	1
Endrin Ketone	1
Heptachlor	1
Heptachlor Epoxide	1
Hexachlorobenzene	1
Methoxychlor	1
Mirex	1
Toxaphene	10
trans-Nonachlor	1
PCB Aroclors (7)	10
PCB Congeners (50)	1

Trace Organic Compounds EPA Method 8270	*50 g in Glass Jar Sample Cost $175*
Organochlorine Compounds and PCBs in Sediment	**MDL µg/kg (ppb)**
2,4'-DDD	1
2,4'-DDE	1
2,4'-DDT	1
4,4'-DDD	1
4,4'-DDE	1
4,4'-DDT	1
Aldrin	1
BHC-alpha	1
BHC-beta	1
BHC-delta	1
BHC-gamma	1
Chlordane-alpha	1
Chlordane-gamma	1
Dieldrin	1
Endosulfan Sulfate	1
Endosulfan-I	1
Endosulfan-II	1
Endrin	1
Endrin Aldehyde	1
Endrin Ketone	1
Hekptachlor	1
Heptachlor Epoxide	1
Hexachlorobenzene	1
Methoxychlor	1
Mirex	1
Toxaphene	10
trans-Nonachlor	1
PCB Aroclors (7)	10
PCB Congeners (50)	1

Table 6-4 Recommended Constituents and Test Method for Organophosphates and PAHs

Trace Organic Compounds EPA Method 625	***1 L in Amber Glass Sample Cost $175***
Organophosphorus Pesticides in Water	**MDL ng/L (pptr)**
Bolstar (Sulprofos)	5
Chlorpyrifos	5
Demeton	5
Diazinon	5
Dichloorvos	5
Dimethoate	5
Disulfoton	5
Ethoprop (Ethoprofos)	5
Fenchlorophos (Ronnel)	5
Fensulfothion	5
Fenthion	5
Malathion	5
Merphos	5
Methyl Parathion	5
Mevinphos (Phosdrin)	5
Phorate	5
Tetrachlorvinphos (Stirofos)	5
Tokuthion	5
Trichloronate	5

Trace Organic Compounds EPA Method 8270	***50 g in Glass Jar Sample Cost $175***
Organophosphorus Pesticides in Sediment	**MDL µg/kg (ppb)**
Bolstar (Sulprofos)	5
Chlorpyrifos	5
Demeton	5
Diazinon	5
Dichloorvos	5
Dimethoate	5
Disulfoton	5
Ethoprop (Ethoprofos)	5
Fenchlorophos (Ronnel)	5
Fensulfothion	5
Fenthion	5
Malathion	5
Merphos	5
Methyl Parathion	5
Mevinphos (Phosdrin)	5
Phorate	5
Tetrachlorvinphos (Stirofos)	5
Tokuthion	5
Trichloronate	5

Polycyclic Aromatic Hydrocarbons (PAHs) EPA Method 8310	***32oz.Widemouth Glass Jar Sample Cost $100***
PAHs in Sediment	**Reporting Limit mg/Kg**
Acenaphthene	0.5
Acenaphthylene	0.5
Anthracene	0.05
Benzo(a)anthracene	0.05
Benzo(a)pyrene	0.05
Benzo(b)fluoranthene	0.05
Benzo(ghi)perylene	0.05
Benzo(k)fluoranthene	0.05
Chrysene	0.05
Dibenzo(a,h)anthrancene	0.05
Fluoranthene	0.05
Fluorene	0.15
Indeno(1,2,3-cd)pyrene	0.05
Naphthalene	0.5
Phenanthrene	0.1
Pyrene	0.05
p-Terphenyl (sur)	%

Table 6-5 Recommended Constituents and Test Method for Volatile Organic Compounds

Volatile Organics & Oxygenates EPA Method 524.2	40ml glass no head space Sample Cost $150
Volatile Organics & Oxygenates in water	**Reporting Limit (RL) µg/L (ppb)**
Dichlorodifluoromethane	0.5
Chloromethane	0.5
1,1,2-Tricloro-1,2,2-Trifluoroethane	0.5
Vinyl Chloride	0.5
Bromomethane	0.5
Chloroethane	0.5
Trichlorofluoromethane	0.5
Diethyl Ether	0.5
1,1-Dichloroethane	0.5
Iodomethane	0.5
Acetone	2
Carbon Disulfide	0.5
Allyl Chloride	0.5
Methylene Chloride	0.5
Acrylonitrile	2
t-1,2-Dichloroethene	0.5
1,1-Dichloroethane	0.5
2-Butanone	1
c-1,2-Dichloroethene	0.5
2,2-Dichloropropane	0.5
Methacrylonitrile	1
Bromochloromethane	0.5
Tetrahydrofuran	1
Chloroform	0.5
1,1,1-Trichloroethane	0.5
1,1-Dichloropropene	0.5
Carbon Tetrachloride	0.5
1,2-Dichloroethane	0.5
Benzene	0.5
Trichloroethene	0.5
1,2-Dichloropropane	0.5
Methyl Methacrylate	0.5
Dibromomethane	0.5
Bromodichloromethane	0.5
c-1,3-Dichloropropene	0.5
4-Methyl-2-Pentanone	2
Toluene	0.5
t-1,3-Dichloropropene	0.5
Ethyl Methacrylate	0.5
1,1,2-Trichloroethane	0.5

Volatile Organics & Oxygenates EPA Method 524.2	40ml glass no head space Sample Cost $150
Volatile Organics & Oxygenates in water	**Reporting Limit (RL) µg/L (ppb)**
1,3-Dichloropropane	0.5
Tetrachloroethene	0.5
2-Hexanone	0.5
Dibromochloromethane	0.5
1,2-Dibromoethane	0.5
Chlorobenzene	0.5
Ethanol	100
1,1,1,2-Tetrachloroethane	0.5
Ethylbenzene	0.5
p/m-Xylene	0.5
o-Xylene	0.5
Styrene	0.5
Bromoform	0.5
Isopropylbenzene	0.5
1,1,2,2-Tetrachloroethane	0.5
t-1,4-Dichloro-2-Butene	0.5
1,2,3-Trilchloropropane	0.5
Bromobenzene	0.5
n-Propylbenzene	0.5
2-Chlorotoluene	0.5
4-Chlorotoluene	0.5
1,3,5-Trimethylbenzene	0.5
Tert-Butylbenzene	0.5
1,2,4-Trimethylbenzene	0.5
sec-Butylbenzene	0.5
p-Isopropyltoluene	0.5
1,3-Dichlorobenzene	0.5
1,4-Dichlorobenzene	0.5
n-Butylbenzene	0.5
Methyl-t-Butyl Ether (MTBE)	1
1,2-Dichlorobenzene	0.5
1,2-Dibromo-3-Chloropropane	0.5
1,2,4-Trichlorobenzene	0.5
Hexachloro-1,3-Butadiene	0.5
Naphthalene	0.5
1,2,3-Trichlorobenzene	0.5
Tert-Butyl Alcohol (TBA)	10
Diisopropyl Ether (DIPE)	2
Ethyl-t-Butyl Ether (ETBE)	2
Tert-Amyl-Methyl Ether (TAME)	2

location. Table 6-5 lists the suite of constituents that will be measured when testing VOCs, the EPA Method number, the recommended reporting limits, and the cost of testing. After the first few rounds, if these constituents are mostly not detected, VOCs could be dropped from both water and sediment sampling. They are generally more of an issue in groundwater, since they tend to volatilize in surface water.

▣ Compton Creek Stream Team

This monitoring program could be managed by a staffed citizen volunteer monitoring program. Ideally, the City of Los Angeles and/or the County of Los Angeles could provide laboratory facilities to accomplish some of the more complex analyses. This leveraged program will cost-effectively provide water quality analysis for a wide range of parameters that will allow characterization of water quality in specific subwatershed areas that feed Compton Creek and ultimately the Los Angeles River. It will allow resource agencies and municipalities to design a comprehensive watershed enhancement and restoration program that improves water quality, and protects natural resources and beneficial uses.

Table 6-6 lists the constituents that can be measured by the Stream Team, whether the analysis is done in the field or the laboratory, and the tools required to evaluate the parameters described above. These constituents can be measured by citizen volunteers with minimal training.

Table 6-6 Stream Team Monitoring

Category	Constituent	Equipment
Conventional Chemistry Field Tests	Dissolved Oxygen & Water Temperature	Meter
	Conductivity & Water Temperature	Meter
	Turbidity	Meter
	pH	Meter
	Salinity	Meter
	Photo Survey	Camera
	Stream discharge or Stormdrain discharge	Flow meter
	Trash quantity and Type	Visual
	Percent Algae Cover & Percent algae types	Tape measure
	Weather Data	Visual
	Oil and Grease	Visual
Nutrients Lab Tests		
	Nitrate+Nitrite-Nitrogen	Colorimeter
	Orthophosphate	Colorimeter
	Ammonia Nitrogen	Colorimeter
Bacteria Lab Tests		
	Total coliforms	IDEXX
	E.coli	IDEXX
	Enterococcus	IDEXX
Other Parameters Lab Tests		
	Chlorophyll-A	Spectrophotometer
	Chloride	Colorimeter
	Hardness	Colorimeter

It is recommended to have citizen volunteers collect and analyze data for conventional parameters and others listed in Table 6-7 on a monthly basis. Citizen monitors also could collect the additional water samples required for metals, organics, VOCs and oxygenates, and toxicity (water and sediment) for delivery to the appropriate laboratory.

▣ Program Options for Water Quality Monitoring

Two potential water quality monitoring programs are presented here to best characterize the water quality in the Watershed. The "optimal" program is the most comprehensive and more expensive but is a more thorough assessment of water and sediment quality. The "minimal" program is believed to be the minimum water quality monitoring necessary to determine if impairments exist, if water quality standards are being met, and beneficial uses protected. In addition to the laboratory costs listed in the above tables, twelve hours a month for a person to coordinate the monitoring effort was calculated into the monitoring costs, based on Heal the Bay's experience managing similar programs. TIE evaluation for toxicity is not part of these cost estimates as it is not known whether they will be needed, although TIE costs could be significant. Costs of conducting the proposed volunteer monitoring program were compared to those of using paid labor and a state-certified laboratory to collect and analyze the samples.

Table 6-7 Optimal Water Quality Monitoring Program

Parameter Type	*Frequency*	# sites
Conventional Parameters	Monthly	9
Nutrients	Monthly	9
Bacteria	Monthly	9
Other (Chlorophyll-a, hardness, chloride)	Monthly	9
Metals	Monthly	9
Organophosphates	Monthly	9
Organochloride	Monthly	9
Volatile Organic Compounds & Oxygenates	Quarterly	9
Toxicity 2 organisms	Quarterly	9
Optimal monitoring program **sediment**		
Metals	Quarterly	3
Organophosphates	Quarterly	3
Organochlorines	Quarterly	3
PAHs	Quarterly	3
Toxicity sediment	Quarterly	3
Optimal monitoring program water column **wet weather**		
Conventional Parameters	4 events	9
Nutrients	4 events	9
Bacteria	4 events	9
Other (Chlorophyll-a, hardness, chloride)	4 events	9
Metals	4 events	9
Organophosphates	4 events	9
Organochloride	4 events	9
Volatile Organic Compounds & Oxygenates	4 events	9
Toxicity 2 organisms	4 events	9

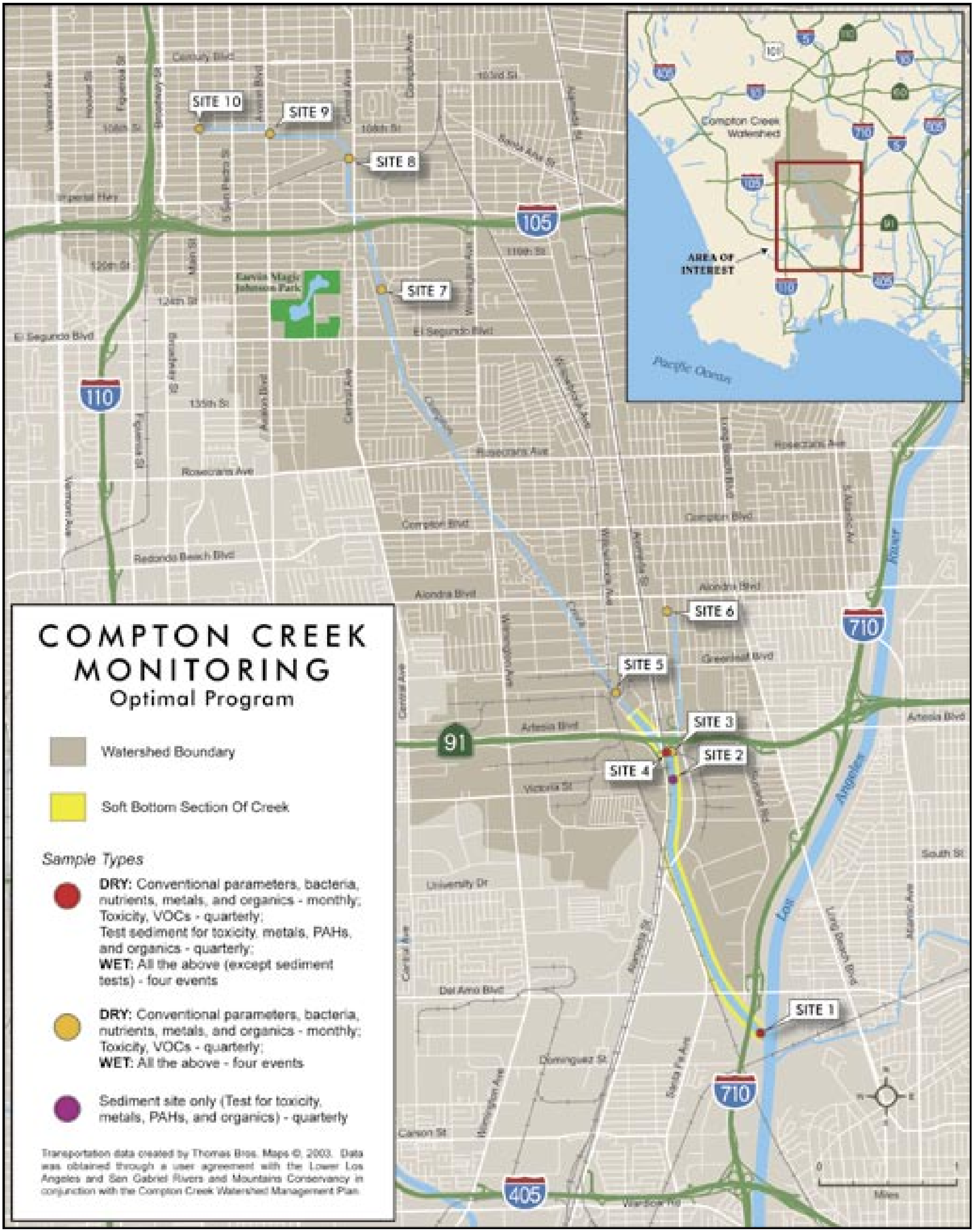

Figure 6-5 Proposed Monitoring Sites—Optimal Program
Source: Los Angeles & San Gabriel Rivers Watershed Council and Heal the Bay

Some of the proposed water quality monitoring, including toxicity sampling, was performed by the SWAMP program this year at one location near Del Amo Boulevard Bioassessment was also conducted. These data may substitute for one of the proposed monitoring points during the first year of the program.

Optimal Program

This program includes monthly sampling for conventional parameters, bacteria, nutrients, metals, and organics at nine sites within the Creek. Toxicity and VOCs would be sampled quarterly from the water column at nine sites. Toxicity, metals, PAHs, and organics would be measured quarterly in sediments at three sites. Four wet weather events would be sampled for conventional parameters, bacteria, nutrients, metals, organics, VOCs, and toxicity at nine sites (all but one of which overlap with the dry-weather locations). This option would provide a thorough water quality assessment for the watershed and should also indicate which subwatersheds are contributing to existing impairments. Additionally, this will help the LARWQCB to evaluate constituents for removal or inclusion on future 303(d) list updates.

The optimal program is estimated to cost up to $301,540 per year if operated by a resource agency or municipality vs. $271,680 utilizing citizen monitors to collect and analyze the sample types previously recommended. This constitutes a $29,860 saving per year or $59,720 over the proposed two year intensive screening. Following this two year screening, constituents that have proved to be insignificant in the Watershed could be removed from the program, and would lessen the cost of the program.

Table 6-8 Minimal Water Quality Monitoring Program

Parameter Type	*Frequency*	# sites
Conventional Parameters	Monthly	9
Nutrients	Monthly	9
Bacteria	Monthly	9
Other (Chlorophyll-a, hardness, chloride)	Monthly	9
Metals	Monthly	9
Organophosphates	Quarterly	4
Organochloride	Quarterly	4
Volatile Organic Compounds & Oxygenates	Quarterly	4
Toxicity 1 organisms	Biannual	4
Minimal monitoring program sediment dry		
Metals	Biannual	2
Organophosphates	Biannual	2
Organochloride	Biannual	2
PAHs	Biannual	2
Toxicity sediment	Biannual	2
Minimal monitoring program water column wet		
Conventional Parameters	2 events	9
Nutrients	2 events	9
Bacteria	2 events	9
Other (Chlorophyll-a, hardness, chloride)	2 events	9
Metals	2 events	9
Organophosphates	2 events	4
Organochloride	2 events	4
Volatile Organic Compounds & Oxygenates	2 events	4
Toxicity 1 organisms	2 events	4

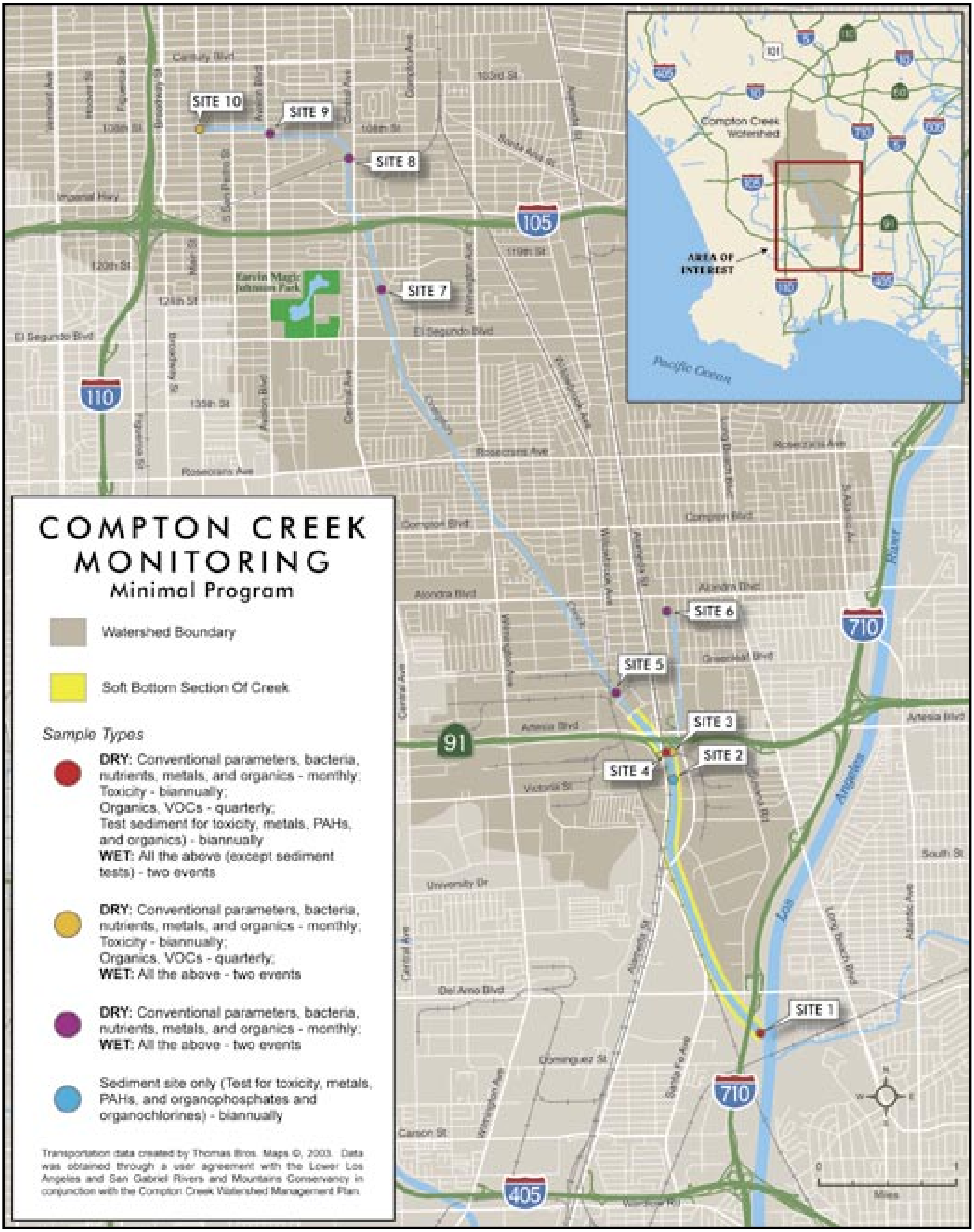

Figure 6-6 Proposed Monitoring Sites—Minimal Program
Source: Los Angeles & San Gabriel Rivers Watershed Council and Heal the Bay

Minimal Program

This option also proposes to conduct monthly sampling for conventional parameters, bacteria, nutrients, other parameters, and metals at nine sites. Organics and VOCs will be sampled quarterly at four locations. Water column toxicity will be sampled biannually at four sites. Toxicity, metals, PAHs, organophosphates and organochlorines would be sampled in sediments at three sites twice a year. Two wet weather events would be sampled for conventional parameters, bacteria, nutrients, metals, and other parameters at all nine sites. Organics, VOCs, and toxicity will be sampled at two wet weather events at four locations. All water column toxicity tests would be performed on only one organism, most likely Ceriodaphnia.

The minimal program is estimated to cost up to $115,180 per year if operated by a resource agency or municipality vs. $86,120 utilizing citizen monitors to collect and analyze the sample types previously recommended. This constitutes a $29,060 saving per year or $58,120 over the proposed two year minimal screening. It is our belief that this program provides the minimal water quality sampling necessary for a watershed assessment. The minimal option will increase the risk that pollutants present in the watershed may escape undetected due to the reduced sampling frequency.

2. Monthly Trash Surveys

Compton Creek has a severe problem with trash and illegal dumping in the stream channel. Mapping the trash type and locations will enable decision makers to focus on areas that are persistently used by individuals or contractors to dispose of their refuse. Additionally, areas with high trash associated with storm drain runoff will help decision makers target storm drains with the highest trash loads for appropriate BMP installation and future TMDL implementation.

3. Annual Stream Assessment

It is recommended that the Compton Creek Stream Team conduct annual stream habitat assessments each spring. The habitat assessment would conduct detailed stream mapping using accurate (sub-meter) global positioning satellite systems (GPS). The following components are recommended:

▣ Mapping of Transient Populations and Encampments in the Channel

There are numerous transient people living in or near the channel of Compton Creek. These populations are potential sources of trash and bacteria. Noting their locations in relation to water quality data will help decision makers determine the impacts from these populations on water quality and how best to address them.

▣ Algae Impairment Mapping

Stream mapping would document the length and percentage of the wetted channel that is covered with algae within the open channel portions of Compton Creek. The habitat mapping would also identify the types of algae present and their relative percentages in Compton Creek.

▣ Amphibian and Wildlife Mapping

During the annual spring habitat assessment volunteers would map locations where amphibians or other wildlife are seen. Amphibians and other wildlife will be identified and recorded.

Annual habitat mapping surveys would be conducted on the 8.5 miles of open channel each spring. Habitat mapping is expected to take between 17 and 20 days, averaging 0.5 mile of mapping per day. It is recommended that mapping teams comprise a minimum of three people for safety purposes. The estimated cost of using a team of three consultants, municipal agency staff, or resource agency staff is estimated at $130.00 per hour or $1040.00 per day. The estimated cost of annual habitat mapping ranges from $17,680 to $20,800 per year. Having the group that conducts the water quality monitoring also conduct the habitat mapping would provide substantial cost savings. The monitoring program leader's salary is already accounted for, and therefore the only cost to the citizen monitoring program would be the integration of GPS data into the GIS, at an estimated cost of $750.00. Using volunteers provides annual cost savings ranging between $16,930 and $20,050.

4. Bird Surveys

It is recommended that the monitoring program conducts biannual bird surveys during winter and spring. Experienced Audubon volunteers may be recruited to help conduct these surveys. Surveys could utilize the point-count method of bird census. Habitats being used and the locations of any nests should be noted. This data should be integrated with the native vegetation mapping data to locate areas of importance.

The estimated cost using Audubon volunteers in conjunction with agency staff for a 10-day survey is estimated to be $80 per hour ($360 per day) for a total cost of $3,600 per event. It is proposed that bird surveys be conducted biannually making the annual agency cost of bird surveys $7,200. Leveraging the citizen monitoring program will result in a total cost of $750 for database integration resulting in a cost savings of $6,450.

5. Benthic Macroinvertebrate Surveys

The recommendation to conduct benthic macroinvertebrate sampling utilizing the California Streams Bioassessment Protocol (CSBP) is to provide a cost-effective tool which utilizes measures of the stream's benthic macroinvertebrate (BMI) community and its physical/habitat structure. BMIs can have a diverse community structure with individual species residing within the stream for a period of months to several years. They are also sensitive, in varying degrees, to temperature, dissolved oxygen, sedimentation, scouring, nutrient enrichment and chemical and organic pollution (Resh and Jackson 1993). Together, biological and physical assessments integrate the effects of water quality over time, are sensitive to multiple aspects of water and habitat quality, and provide the public with more familiar expressions of ecological health (Gibson 1996). Additionally, BMI surveys can be repeated in the future to help determine if water quality improvement projects have corrected the conditions within Compton Creek. Recently the California Department of Fish and Game has created an Index of Biological Integrity for southern California. This index provides an easy to use tool to determine the quality of habitat and biological communities at a given site. BMI surveys were recommended because they provide a better more long-term look at water quality and habitat impacts on biological communities, are easily repeatable, and can be used in the future to determine if watershed projects have improved the conditions in Compton Creek.

It is recommended that annual benthic macroinvertebrate surveys be conducted at three locations in the earthen-bottom portion of Compton Creek, in the spring. Surveyors should follow the California Department of Fish and Game's California Stream Rapid Bioassessment Protocols. All samples would be collected by certified professional staff and volunteers. Samples will be identified to the lowest possible taxon by a certified entomology laboratory. One site in the lower Creek was included in the 2005 SWAMP sampling just completed.

Sample collection costs by a professional laboratory are estimated to be a total of $1,000. It is recommended that all samples be identified by a professional entomology laboratory and therefore no cost savings will be realized for identification. Sample identification costs roughly $1,200 per site. Total costs of benthic macroinvertebrate sampling and identification would be $4,600 per year if performed by an agency. Sample collection costs for a citizen monitoring program will be approximately $100 per site or $3,700 per year.

6. Native Vegetation Mapping Survey

A field botanist would accompany volunteers and professional staff to map the native vegetation in the earthen-bottom portion of Compton Creek. The earthen-bottom portion is 2.7 miles long. This would be a single mapping effort that can be repeated in the future. The vegetation data will be useful for future restoration planning and documenting bird habitat. It is estimated that the native vegetation mapping effort will take approximately 10 days and will require a botanist, GPS technician, and a field technician. The estimated cost of the vegetation mapping team from a consulting company, municipal, or resource agency is $140 per hour or $1,120 per day. The overall cost of a one time native vegetation mapping effort led by an agency or consulting firm is estimated to $11,200. The same effort run by citizen monitoring group in conjunction with a hired field botanist is estimated at $55 per hour or $440 per day for a total cost of $4,400. Leveraging the citizen monitoring program will result in an estimated savings of $6,800. Additional savings could be realized by conducting the vegetation survey as an update to the less-detailed mapping done in 2002 by LASGRWC. As the channel has since been compacted several times, and additional native vegetation recently planted by the County, this may or may not be useful.

7. Storm Drain Outlet Mapping

Determining whether a storm drain connection is illegal or illicit is required under the County of Los Angeles MS-4 permit. While some of this mapping was done previously by LASGRWC to assess channel conditions, it was a qualitative review. The data are not geo-referenced and have not been converted to electronic format. This process would be made much easier through accurate GPS mapping of existing storm drain outlets in Compton Creek. Volunteers and professional staff would identify, measure, and map all discharge points that empty into the open portion of Compton Creek. These points can then be evaluated by resource agencies and municipalities to determine if they are legally permitted discharges. Storm drain data can also be used in conjunction with dump site mapping to determine the most appropriate locations for BMPs or enforcement actions.

All data collected and mapped with GPS systems can be easily be integrated into a geographic information system (GIS) maintained by the monitoring group. These data should be widely distributed for use by all stakeholders. It is estimated that the storm drain mapping project will take 10 to 15 days. The average cost per hour of a consulting team, resource or municipal agency team is $130 ($1,040 a day) for a total cost of up to $15,600. Leveraging the citizen monitoring program would save labor costs, resulting in a total cost of only $750 for GIS integration.

E. ADDITIONAL PROGRAM COMPONENTS

1. Quality Assurance Project Plan (QAPP)

A QAPP is a document that states the requirements, testing methods, accuracies, equipment used, and general procedures that a monitoring program follows to assure the data they collect is accurate, reliable, and useable by decision makers. It is imperative that any monitoring program clearly state the procedures, equipment, and protocols they will use to collect and analyze data. It is recommended that the monitoring group coordinating any effort in Compton Creek produce a QAPP that is compatible with the SWAMP program. SWAMP will soon have an Internet-based QAPP “advisor” program which will allow for on-line design of QAPPs consistent with SWAMP utilizing pre-existing templates pulled together through answering a series of questions.

If multiple laboratories will be used for analysis, an inter-calibration effort similar to those conducted by the Southern California Coastal Waters Research Project Bight studies should be performed with the laboratories used, other potential monitoring entities, the citizen monitoring group, and at least two state certified laboratories. This inter-calibration assures that data collection and analysis is consistent between the groups and that split samples should be comparable. Additionally, we recommend one or two split sampling events per year. Samples are collected in large containers and split between the laboratory that normally analyzes the samples and one of the other state certified laboratories. This allows comparison of data accuracy and reliability.

2. Data Management

It is recommended that the group charged with coordinating the monitoring effort also manage the data. One option is to make the data available for both analysis and download over the internet similar to Heal the Bay’s Stream Team website at http://www.healthebay.org/streamteam. The website concept allows community members and local agencies to review the data and perform simple analysis online. Resource agencies, students, and other interested parties can download data as an Excel file to perform their own analysis. This technique allows the data to be utilized by the most people and engages the community in education and outreach. It would be recommended that any data collected also be compatible with SWAMP. There will soon be an upload feature within the Internet version of SWAMP to facilitate this.

Following the two year screening process a "State of the Watershed Report" could be created by the group coordinating the monitoring effort. This report should be made available to all stakeholders and interested community members. The raw data should also be available over the internet to all interested parties over the course of the project.

F. CONCLUSION

This chapter has presented two potential monitoring programs that could be implemented in the Watershed. It is our recommendation that a coordinated effort between the resource agencies, municipalities, environmental groups, and community groups be established to create a comprehensive monitoring program for the Watershed that leverages existing efforts underway by the City of Los Angeles, FoLAR, and SWAMP. Since most of the sampling is occurring in the same area of the Creek, retooling these programs could allow greater spatial and temporal coverage with little or no increased cost. Citizen monitors, led by a community group or environmental group with community support, could coordinate the monitoring program. This would include equipment purchases, volunteer training and coordination, sample collection and analysis of conventional parameters, nutrients, bacteria, and other parameters. In addition, citizen monitors with staff supervision could also collect water and sediment samples to be sent to a laboratory for more advanced analysis.

The estimated first year costs of the monitoring program options range from $96,471 to $357,820, as summarized in Table 6-9 below. These costs will vary depending on who manages the program, who conducts the field work, and where the analysis is performed. This estimate includes one-time costs for vegetation and storm drain mapping. Costs could be reduced significantly by taking advantage of existing programs and redirecting resources from areas where duplication currently exists. After the first year, costs could be further reduced by eliminating constituents not detected during the first year, or by reducing the number of sampling events.

Funding could be provided by numerous sources including state grant (as available), the LARWQCB, Watershed cities, and the USACE. The program coordinator would also be able to lead the mapping and habitat assessment efforts described above. This would provide critical additional data at minimal extra cost. It is expected that following the intensive screening process the monitoring program will be able to dramatically reduce the number of constituents sampled and the cost of sampling. Investments made now in assessment and source control could also be offset by lower costs to comply with future TMDLs. Ultimately, restoration and management efforts will be able to focus on areas and pollutants that actually impact the water quality and ecological health of the Watershed.

Table 6-9 Comparison of Estimated Annual Monitoring Costs

Monitoring Type	*Optimal Agency*	*Optimal Volunteer*	*Minimal Agency*	*Minimal Volunteer*
Water Quality	301,540	271,680	115,180	86,120
Habitat Mapping	17,680	750	17,680	750
Native vegetation mapping	11,200	4,400	11,200	4,400
Bird Surveys	7,200	750	7,200	750
Benthic Macroinvertebrate sampling	4,600	3,700	4,600	3,700
Total Monitoring Costs per year	**$342,220**	**$281,280**	**$155,860**	**$95,720**

This monitoring program has been designed to definitively provide the information necessary to detail the current water quality and biological health of the Watershed, and determine whether water quality objectives are being met both in dry and wet weather. The monitoring program will provide the data necessary to identify watershed areas that contribute to existing impairments and prioritize pilot BMP projects that could target these areas. Mapping the trash type and locations in the Creek will enable decisionmakers to focus on areas that are persistently used to improperly dispose of refuse. Identifying areas with high trash associated with storm drain runoff will help decisionmakers to further target storm drains for appropriate BMP installation to reduce trash sources to the Creek.

As projects are implemented that incorporate BMPs for water quality treatment or runoff reduction, the effectiveness of the BMPs should be assessed to determine potential water quality impacts. This will help to interpret results of the monitoring program and inform decisions about future project planning and design. Collectively, these data will provide decisionmakers and permittees with the ability to create a watershed-wide restoration program that addresses the sources of pollutants and water quality and habitat degradation problems identified during the course of the watershed assessment. Over time, the data will also provide quantifiable measures of water quality improvements and compliance with existing and future TMDLs.