INTEGRATED MONITORING PROGRAM FOR LONG BEACH INNER HARBOR, LONG BEACH OUTER HARBOR, AND EASTERN SAN PEDRO BAY

Prepared for the City of Long Beach

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ANCHOR QEA

Content

INTEGRATED MONITORING PROGRAM FOR LONG BEACH INNER HARBOR, LONG BEACH OUTER HARBOR, AND EASTERN SAN PEDRO BAY

1 Introduction

This Integrated Monitoring Program (IMP) consists of receiving water monitoring, total maximum daily load (TMDL) compliance monitoring, stormwater and non-stormwater outfall monitoring, new development/re-development effectiveness tracking, and regional study.

2 Waterbody-Pollutant Classification

Waterbody-pollutant combination has been prioritized and is summarized in Table 1. The highest priority water quality issues include all Category 1 waterbody-pollutant combinations due to their listing in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (Harbor Toxics TMDL). These waterbody-pollutant combinations include copper, lead, zinc, total polycyclic aromatic hydrocarbons (PAHs), total dichlorodiphenyltrichloroethanes (DDTs), and total polychlorinated biphenyls (PCBs) in sediment for Inner Harbor, Outer Harbor, and eastern San Pedro Bay. All high priority pollutants in Long Beach Inner Harbor, Long Beach Outer Harbor, and eastern San Pedro Bay are included in a TMDL compliance regional monitoring program, which is conducted by the Regional Monitoring Coalition (RMC). The Harbor Toxics TMDL encouraged formation of a regional monitoring coalition for TMDL compliance monitoring. The City of Long Beach (City) has been actively involved in the RMC since its formation in 2013. The RMC's Coordinated Compliance Monitoring and Reporting Plan (CCMRP) was approved by the Regional Water Board on June 6, 2014. The RMC's first sediment sampling event was conducted in coordination with the Bight 2013 program. The first water and fish tissue sampling events were conducted in September 2014. Medium priority pollutants in Long Beach Inner Harbor, Long Beach Outer Harbor, and eastern San Pedro Bay are also included in the TMDL monitoring, except for Bis(2-ethylhexyl)phthalate in water, which will be monitored via receiving water monitoring.

Table 1. Water quality issue prioritization.

Waterbody	Highest Priority	High Priority			Medium Priority	
	Sediment	Water	Sediment	Fish	Water	Sediment
Long Beach Inner Harbor	Copper, lead, zinc, total PAHs, total DDTs, total PCBs	None	Mercury	Total chlordanes	Bis(2-ethylhexyl)phthalate, copper, mercury, zinc, chrysene, pyrene	None
Long Beach Outer Harbor	Copper, lead, zinc, total PAHs, total DDTs, total PCBs	None	None	None	Pyrene, bis(2-ethylhexyl)phthalate	Nickel
Eastern San Pedro Bay	Copper, lead, zinc, total PAHs, total DDTs, total PCBs	None	None	None	Pyrene, bis(2-ethylhexyl)phthalate	None

3 Monitoring Sites and Approach

Proposed monitoring locations for receiving water monitoring and TMDL compliance monitoring are summarized in Table 2.

3.1 Receiving Water Monitoring Sites

In coordination with the Harbor Toxics TMDL monitoring plan (i.e., CCMRP), one station was selected in Outer Long Beach Harbor (equivalent to CCMRP Station 16) and one station was selected in eastern San Pedro Bay (equivalent to CCMRP Station 19). Detailed methods are provided in the CCMRP. See Figure 1 for sample locations. For efficiency, it is recommended that the monitoring conducted to satisfy the requirements of the TMDL satisfies the receiving water monitoring requirements of the IMP. CCMRP monitoring results will be reviewed and incorporated into the IMP annual report by summary and reference only.

3.2 TMDL Monitoring Sites

The Harbor Toxics TMDL requires all 22 locations for monitoring (Figure 2). CCMRP Stations 1 through 11 are located within Port of Los Angeles waters, and CCMRP Stations 12-22 (see Figure 1) are located in Long Beach Inner Harbor, Long Beach Outer Harbor, and eastern San Pedro Bay. Detailed methods are provided in the CCMRP. For efficiency, it is recommended that the monitoring conducted to satisfy the requirements of the TMDL satisfies the receiving water monitoring requirements of the IMP. CCMRP monitoring results will be reviewed and incorporated into the IMP annual report by summary and reference only.

3.3 MS4 Stormwater Outfall Monitoring Sites

Part VIII. A.2. in Attachment E to the MS4 permit contains criteria when selecting outfalls for stormwater monitoring.

"a. The storm water outfall based monitoring program should ensure representative data by monitoring at least one major outfall per subwatershed (HUC-12 or HUC-12 equivalent) drainage area, within the Permittee's jurisdiction, or alternate approaches as approved in an IMP or CIMP.

b. The drainage(s) to the selected outfall(s) shall be representative of the land uses within the Discharger's jurisdiction.

c. If the Discharger implements an IMP, to the extent possible, the selected outfalls shall not receive drainage from another jurisdiction. If this is not possible, the Discharger shall conduct 'upstream' and 'downstream' monitoring as the system enters and exits the Discharger's jurisdiction.

d. The Discharger shall select outfalls with configurations that facilitate accurate flow measurement and consideration of safety of monitoring personnel.

e. The specific location of sample collection may be within the MS4 upstream of the actual outfall to the receiving water if field safety or accurate flow measurement require it."

The Port of Long Beach area consists of two HUC-12 equivalent subwatersheds (HUC 180701050402 and HUC 180701060701). The Port of Long Beach proposes to monitor stormwater discharges from two sampling stations, one each from the two HUC-12 equivalent subwatersheds within the Port and representative of Port land uses (Figure 1). The first station (Outfall No. 85) will be located in Middle Harbor (HUC 180701050402). The second station will be located on Piers S (HUC 180701060701); however, due to the tidal nature of the outfall for this drainage area, samples will be collected at the nearest upstream non-tidal access point (Pump Station No. 7).

Table 2. Monitoring site designation and monitoring function.

Site Name	Waterbody	Type of site	Location in WGS84	
			Latitude (N)	Longitude (W)
Outfall 85	Inner Long Beach Harbor	MS4/Stormwater Outfall water	33.763596	-118.219756
Pump Station 7	Inner Long Beach Harbor	MS4/Stormwater Outfall water	33.759708	-118.237000
CCMRP Station 16	Outer Long Beach Harbor	Receiving Water/TMDL water, sediment, and fish	33.731449	-118.221000
CCMRP Station 19	Eastern San Pedro Bay	Receiving Water/TMDL water and sediment	33.736671	-118.131591
CCMRP Station 12	Inner Harbor Long Beach	TMDL water and sediment	33.768331	-118.228351
CCMRP Station 13	Inner Harbor Long Beach	TMDL water and sediment	33.753832	-118.216340
CCMRP Station 14	Inner Harbor Long Beach	TMDL water and sediment	33.748982	-118.230825
CCMRP Station 15	Inner Harbor Long Beach	TMDL water and sediment	33.742143	-118.199488
CCMRP Station 17	Outer Harbor Long Beach	TMDL water and sediment	33.727594	-118.186058
CCMRP Station 18	Eastern San Pedro Bay	TMDL water and sediment	33.753832	-118.181332
CCMRP Station 20	Eastern San Pedro Bay	TMDL water, sediment, and fish	33.725480	-118.157332
CCMRP Station 21	Los Angeles River Estuary	TMDL water and sediment	33.756444	-118.157332
CCMRP Station 22	Los Angeles River Estuary	TMDL water and sediment	33.761013	-118.202111

Latitude and longitude are in decimal degrees.

Figure 1. IMP monitoring sites in Long Beach Inner Harbor, Long Beach Outer Harbor, and eastern San Pedro Bay. Table 2 contains the coordinates of these sites.

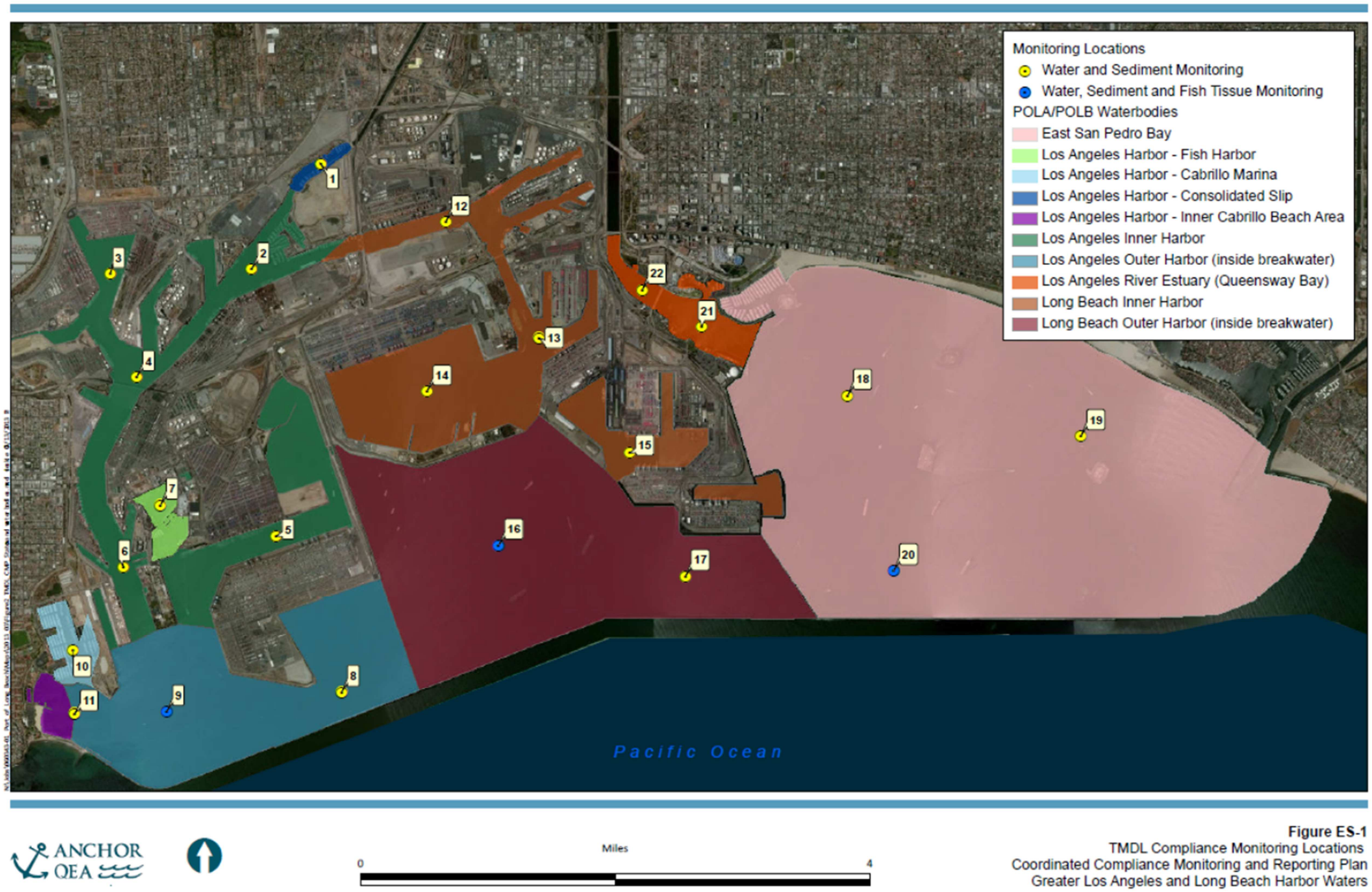

Figure 2. Harbor Toxics TMDL Coordinated Compliance Monitoring and Reporting Plan, CCMRP monitoring stations in Greater Los Angeles and Long Beach Harbor waters. Stations 12 through 22 are located within Long Beach Inner and Outer Harbor waters and eastern San Pedro Bay.

3.4 Non-Stormwater Outfall Monitoring

The Port of Long Beach (Port) has developed an Illicit Discharge Detection and Elimination program to detect, investigate, and eliminate illicit discharges, including illegal dumping, into its system in accordance with the existing permit**.**

There are 224 stormwater outfalls throughout the Harbor District. All outfalls discharge to Inner or Outer Long Beach Harbor, with the exception of seven outfalls that discharge to the Los Angeles River Estuary. It should be noted that 15 of these outfalls that are located on Pier H and discharge into the Los Angeles River Estuary are not operated by the Port; these outfalls will be subject to the screening assessment process indicated above.

On a monthly basis, the Port visits all stormwater outfalls in the Harbor District on days with no precipitation in an effort to detect and eliminate unauthorized non-stormwater discharges (NSWDs). This is accomplished using a small vessel narrow enough to fit in between closely constructed piles and access outfalls located beneath wharf faces. Inspections are scheduled to coincide with the low tide. Notations of the following are made:

- Presence or absence of flow/moisture
- Presence or absence of stains
- Presence or absence of sludge
- Odor (if any)
- Other abnormal conditions

A detailed report is generated noting observations made at accessible outfalls and is submitted to the Port Environmental Planning Division. If evidence of ongoing potential illegal dumping or illicit connections to the storm drain system is noted, the Port Environmental Planning Division is immediately contacted.

3.5 New Development/Re-Development Effectiveness Tracking

The Monitoring and Reporting Program (MRP), Attachment E to the MS4 Permit requires that Permittees develop a New Development/Re-Development Effectiveness tracking program. The City has developed mechanisms for tracking information related to new and redevelopment projects that are subject to post-construction best management practice (BMP) requirements in Part VI.D.7 of the MS4 Permit.

3.6 Regional Studies

There are three large long-term regional monitoring programs that are conducted in the area inclusive of this IMP. The City's Harbor Department actively participates in two regional monitoring programs: the Southern California Bight (SCB) Regional Monitoring Program and the Biological Baseline Study. In addition, Heal the Bay manages the Beach Report.

3.6.1 Southern California Bight Regional Monitoring Program

The SCB is the approximate 400 miles of coastline from Point Conception in Santa Barbara County to Cabo Colnett in Ensenada, Mexico. The Southern California Coastal Water Research Project coordinates an extensive monitoring program within the SCB approximately every 5 years. The Bight program began in 1994, and data gathered during monitoring events have allowed for long-term tracking of benthic communities, fisheries, water quality, sediment chemistry and toxicity, and the general health of the SCB over time. This complex program incorporates multiple agencies and organizations, and as such, a series of guidance documents for field data collection, laboratory analyses, quality assurance, and data management have been created for each monitoring event.

The City's Harbor Department currently participates in the Bight monitoring programs. Since 2013, the sediment quality component of the Harbor Toxics TMDL has been integrated with the Bight monitoring program.

3.6.2 Biological Baseline Study

The City's Harbor Department currently participates in San Pedro Bay-wide Biological Baseline Studies in coordination with the Port of Los Angeles. This comprehensive regional program consists of studies to evaluate the area's physical and ecological characteristics, including kelp and eelgrass habitat, plankton, fish, and marine bird populations. The Biological Baseline Study is conducted approximately every 5 years.

4 Monitoring Schedule and Frequencies

Monitoring schedule and frequencies for the receiving water monitoring at CCMRP Stations 16 and 19, the Harbor Toxics TMDL monitoring at CCMRP stations 12 through 22, and the MS4 stormwater outfall monitoring stations are summarized in Table 3.

4.1 Receiving Water Monitoring Sites

Water column samples will be collected three times annually, two during wet weather events and one during a dry weather event, in order to coordinate with the RMC Harbor Toxics TMDL coordinated compliance monitoring. Two wet weather events instead of three wet weather events as specified in the MRP are deemed sufficient. This is because water column testing (physical parameters) at various depths performed in the TMDL monitoring according to the CCMRP will provide better data on mixing using total suspended solids (TSS). Besides two receiving water stations, an additional 20 TMDL CCMRP stations cover greater areas of receiving waters than typical nearshore monitoring for MS4 permits, minimizing potential water-based deployments for catching two wet weather events versus three wet weather events: and wet weather storms identified as greater than 0.25-inch precipitation targeting larger rain events that are likely to impact receiving water.

The first large storm of the season will be targeted as one of the two wet weather events and will have a predicted rainfall of at least 0.25 inch (0.64 centimeter) with a 70 percent probability of rainfall at least 24 hours prior to the event start time.

The first dry weather receiving water monitoring will start at two stations in the dry season of 2015, assuming the IMP is approved prior to the dry season. The first wet weather receiving water monitoring will start in the wet season of 2015-2016 assuming the IMP is approved prior to the wet season.

Aquatic toxicity testing will be conducted for all three (two wet and one dry weather) sampling events for the first year at each of CCMRP stations 16 and 19. If all toxicity tests from the three sampling events show no toxicity, aquatic toxicity tests will not be included in the following year.

4.2. TMDL Monitoring Sites

Sampling schedule and frequency are specified in the CCMRP. At stations 12 through 22, the schedule is designed for the next 10 years and segmented by season, where fall is defined as October 1 to December 31, winter is January 1 to March, spring is April 1 to June 30, and summer is July 1 to September 30. Water quality monitoring is to occur three times annually during two wet weather events and one dry weather event. The wet weather events will consist of two in winter, and the dry weather event will be in summer. Sediment quality monitoring will occur at every station two times every 5 years. The sampling is scheduled in summer during the years 2016, 2018, 2021, 2023, 2026, and 2028. Fish tissue sampling will occur at two stations (stations 16 and 20) biennially. The sampling is scheduled in summer during the years 2016, 2018, 2020, 2022, 2024, 2026, and 2028.

4.3 Stormwater Outfall Monitoring Sites

The Port of Long Beach proposes to sample three wet events per year in coordination and consistent with the Harbor Toxics TMDL compliance monitoring requirements. The first storm of the season will be targeted. The first storm is defined as having a predicted rainfall of at least 0.25 inch at a 70% probability or rainfall at least 24 hours prior to the event start time. Two additional wet weather events occurring in the same wet weather season will be sampled. Depending on the seasonal forecast (e.g., drought vs. wet years), these additional wet weather events will consist of a storm that produces at least 0.1 inch of rain per day. All storm events will be separated by an antecedent dry period (less than 0.1 inch of rain per day) of at least 72 hours, but consideration will be given to monitor larger storm events (0.5 inch or greater) if forecasted. The first wet weather receiving water monitoring will start in the wet season of 2015 to 2016, assuming the IMP is approved prior to the wet season. Dry weather monitoring will be implemented as part of the Port of Long Beach's ongoing non-stormwater outfall monitoring program.

Table 3. Schedule for implementation of monitoring activities.

	Station	Type of monitoring	Dry 2015	Wet 2015/2016	Dry 2016	Wet 2016/2017	Dry 2017	Wet 2017/2018	Dry 2018
Receiving water/TMDL	CCMRP 16	Chemistry[1] and field measurements	1	2	1	2	1	2	1
		Aquatic toxicity[2]	1	2	1	2	1	2	1
	CCMRP 19	Chemistry[1] and field measurements	1	2	1	2	1	2	1
		Aquatic toxicity[2]	1	2	1	2	1	2	1
TMDL monitoring	CCMRP 12 - 22	Water column	1	2	1	2	1	2	1
		Sediment	0	0	1	0	0	0	1
		Fish tissue	0	0	1	0	0	0	1
Stormwater outfall	Outfall No. 85 and Pump Station No.7	Chemistry[1] and field measurements	0	3	0	3	0	3	0
Non-stormwater outfall	Outfalls	Inventory and screen[3]	Ongoing (monthly)	Ongoing (monthly)	Ongoing (monthly)	Ongoing (monthly)	Ongoing (monthly)	Ongoing (monthly)	Ongoing (monthly)
		Source ID[4]			Ongoing		Ongoing		Ongoing
		Monitoring[5]			TBD		TBD		TBD

1 Table E-2 chemical analyses will be performed once during the first wet weather event and once during the first dry weather event. Parameters that exceed method detection limits and available water quality objectives will continue to be monitored along with all parameters included as Category 1, 2, or 3 waterbody-pollutant classifications for the subject waterbody. Wet and dry weather chemical parameters will be separately assessed for purposes of continued monitoring. All parameters classified as highest, high, and medium priority waterbody-pollutants in the waterbody will continue to be monitored during the permit cycle unless the parameters (primarily medium priority parameters) are shown to not be present at levels of concern on a consistent basis.

2 If all toxicity tests from the three sampling events of the first year show no toxicity at a monitoring station, aquatic toxicity tests will not be included in the following year at that monitoring station.

3 The Port developed and has been implementing an NSWD monthly monitoring program. See Section 3.3

4 Source tracking and classification work depend upon the number of sites categorized as Suspect outfalls with evidence of significant flow.

5 Monitoring will be implemented if significant dry weather flows are identified at discharge points that cannot be identified, are non-essential exempt flows, or are identified as illicit flows that are not yet controlled.

5 Chemical/Physical Parameters

Implementation of the IMP will be integrated with the Harbor Toxics TMDL compliance monitoring program. At a minimum, the IMP requires monitoring for the following parameters:

- Pollutants assigned a receiving water limitation derived from TMDL Waste Load Allocations
- Other pollutants identified on the Clean Water Act (CWA) Section 303(d) List for the receiving water or downstream receiving waters
- Aquatic toxicity

Flow will not be monitored at receiving water stations. Suspended sediment concentration will not be monitored because Long Beach Harbor and San Pedro Bay are not listed on the CWA Section 303(d) List for sedimentation, siltation, or turbidity. TSS will be monitored because it is listed in the Harbor Toxics TMDL as a required analytical parameter to understand sedimentation sources.

The Harbor Toxics TMDL compliance monitoring program contains a set of analytical parameters that are required based on historical detections or known chemical sources to the marine habitat. The guidance for the IMP requires a greatly expanded list of parameters that have various relevancies to the marine environment. It is proposed that the expanded IMP analyte list (Table E-2) be implemented for the first wet and dry weather receiving water quality monitoring events at the two receiving water stations (i.e., CCMRP Stations 16 and 19). Results of initial wet weather and dry weather monitoring at these two sites will be used to determine necessity of specific analytes beyond the TMDL required analyte list. As specified in the MS4 Permit, if the parameter was not detected in the first event.

Table 4 lists the analytical parameters required as part of the Harbor Toxics TMDL compliance monitoring program and identifies the additional parameters required to be monitored during the first wet (receiving water and stormwater outfall) and dry weather (receiving water only) monitoring events as part of this IMP.

Table 4. Parameters monitoring via receiving water monitoring and TMDL compliance monitoring.

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
Physical	Flow					Required
Conventional Pollutants	Oil and grease				Required	TBD[2]
	Total Phenols				Required	TBD[2]
	Cyanide				Required	TBD[2]
	pH				Required	Required
	Temperature				Required[1]	Required
	Dissolved Oxygen				Required[1]	Required
	Lipids			Required		
Bacteria (Single Sample Limits)	Total coliform (marine waters)				Required[1]	TBD[2]
	Enterococcus (marine waters)				Required[1]	TBD[2]
	Fecal coliform (marine & fresh waters)				Required[1]	TBD[2]
	E.coli (fresh waters)				Required[1]	TBD[2]
General	Dissolved Phosphorus				Required[1]	TBD[2]
	Total Phosphorus				Required[1]	TBD[2]
	Turbidity				Required[1]	TBD[2]
	Total Suspended Solids	Required	Required			Required
	Total Dissolved Solids		Required		Required[1]	TBD[2]
	Volatile Suspended Solids				Required[1]	TBD[2]
	Total Organic Carbon		Required		Required[1]	TBD[2]
	Total Petroleum Hydrocarbon				Required[1]	TBD[2]
	Biochemical Oxygen Demand				Required[1]	TBD[2]
	Chemical Oxygen Demand				Required[1]	TBD[2]
	Total Ammonia-Nitrogen				Required[1]	TBD[2]
	Total Kieldahl Nitrogen				Required[1]	TBD[2]
	Nitrate-Nitrite				Required[1]	TBD[2]
	Alkalinity				Required[1]	TBD[2]
	Specific Conductance				Required[1]	Required

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	Total Hardness				Required[1]	Required
	MBAS				Required[1]	TBD[2]
	Chloride				Required[1]	TBD[2]
	Fluoride				Required[1]	TBD[2]
	Methyl tertiary butyl ether (MTBE)				Required[1]	TBD[2]
	Perchlorate				Required[1]	TBD[2]
Metals	Aluminum				Required[1]	TBD[2]
	Antimony				Required[1]	TBD[2]
	Arsenic				Required[1]	TBD[2]
	Beryllium				Required[1]	TBD[2]
	Cadmium	Required	Required			TBD[2]
	Chromium (total)	Required	Required			TBD[2]
	Chromium (Hexavalent)				Required[1]	TBD[2]
	Copper	Required	Required			Required
	Iron				Required[1]	TBD[2]
	Lead	Required	Required			TBD[2]
	Mercury	Required	Required			TBD[2]
	Nickel				Required[1]	TBD[2]
	Selenium				Required[1]	TBD[2]
	Silver				Required[1]	TBD[2]
	Thallium				Required[1]	TBD[2]
	Zinc	Required	Required			Required
Semivolatile Organic Compounds	2-Chlorophenol				Required[1]	TBD[2]
	4-Chloro-3-methylphenol				Required[1]	TBD[2]
	2,4-Dichlorophenol				Required[1]	TBD[2]
	2,4-Dimethylphenol				Required[1]	TBD[2]
	2,4-Dinitrophenol				Required[1]	TBD[2]
	2-Nitrophenol				Required[1]	TBD[2]

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	4-Nitrophenol				Required[1]	TBD[2]
	Pentachlorophenol				Required[1]	TBD[2]
	Phenol				Required[1]	TBD[2]
	2,4,6-Trichlorophenol				Required[1]	TBD[2]
	Acenaphthene		Required		Required[1]	TBD[2]
	Acenaphthylene				Required[1]	TBD[2]
	Anthracene		Required		Required[1]	TBD[2]
	Benzidine				Required[1]	TBD[2]
	1,2 Benzanthracene				Required[1]	TBD[2]
	Benzo(a)pyrene		Required		Required[1]	TBD[2]
	Benzo[a]anthracene		Required		Required[1]	TBD[2]
	Benzo(e)pyrene		Required		Required[1]	TBD[2]
	Benzo(o,h,i)perylene				Required[1]	TBD[2]
	3,4 Benzoflouranthene				Required[1]	TBD[2]
	Benzo(k)flouranthene				Required[1]	TBD[2]
	Biphenyl		Required			
	Bis(2-Chloroethoxy) methane				Required[1]	TBD[2]
	Bis(2-Chloroisopropyl) ether				Required[1]	TBD[2]
	Bis(2-Chloroethyl) ether				Required[1]	TBD[2]
	Bis(2-Ethylhexl) phthalate				Required[1]	TBD[2]
	4-Bromophenyl phenyl ether				Required[1]	TBD[2]
	Butyl benzyl phthalate				Required[1]	TBD[2]
	2-Chloroethyl vinyl ether				Required[1]	TBD[2]
	2-Chloronaphthalene				Required[1]	TBD[2]
	4-Chlorophenyl phenyl ether				Required[1]	TBD[2]
	Chrysene		Required		Required[1]	TBD[2]
	Dibenzo(a.h)anthracene		Required		Required[1]	TBD[2]
	1,3-Dichlorobenzene				Required[1]	TBD[2]

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	1,4-Dichlorobenzene				Required[1]	TBD[2]
	1,2-Dichlorobenzene				Required[1]	TBD[2]
	3,3-Dichlorobenzidine				Required[1]	TBD[2]
	Diethyl phthalate				Required[1]	TBD[2]
	Dimethyl phthalate				Required[1]	TBD[2]
	di-n-Butyl phthalate				Required[1]	TBD[2]
	2,4-Dinitrotoluene				Required[1]	TBD[2]
	2,6-Dinitrotoluene				Required[1]	TBD[2]
	4,6 Dinitro-2-methylphenol				Required[1]	TBD[2]
	2,6- Dimetthylnapthalene		Required			
	1,2-Diphenylhydrazine				Required[1]	TBD[2]
	di-n-Octylphthalate				Required[1]	TBD[2]
	Fluoranthene		Required		Required[1]	TBD[2]
	Fluorene		Required		Required[1]	TBD[2]
	Hexachlorobenzene				Required[1]	TBD[2]
	Hexachlorobutadiene				Required[1]	TBD[2]
	Hexachloro-cyclopentadiene				Required[1]	TBD[2]
	Hexachloroethane				Required[1]	TBD[2]
	Indeno(1,2,3-cd)pyrene				Required[1]	TBD[2]
	Isophorone				Required[1]	TBD[2]
	1-Methylnapthalene		Required			
	2-Methylnapthalene		Required			
	1-Methylphenanthrene		Required			
	Naphthalene		Required		Required[1]	TBD[2]
	Nitrobenzene				Required[1]	TBD[2]
	N-Nitroso-dimethyl amine				Required[1]	TBD[2]
	N-Nitroso-diphenyl amine				Required[1]	TBD[2]
	N-Nitroso-di-n-propyl amine				Required[1]	TBD[2]

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	Phenanthrene		Required		Required[1]	TBD[2]
	Perylene		Required			
	Pyrene		Required		Required[1]	TBD[2]
	1,2,4-Trichlorobenzene				Required[1]	TBD[2]
Chlorinated Pesticides	Aldrin				Required[1]	TBD[2]
	alpha-BHC				Required[1]	TBD[2]
	beta-BHC				Required[1]	TBD[2]
	delta-BHC				Required[1]	TBD[2]
	qamma-BHC (lindane)				Required[1]	TBD[2]
	alpha-chlordane	Required	Required	Required		TBD[2]
	gamma-chlordane	Required	Required	Required		TBD[2]
	Oxychlordane		Required	Required	Required[1]	TBD[2]
	cis-Nonachlor		Required	Required	Required[1]	TBD[2]
	trans-Nonachlor		Required	Required	Required[1]	TBD[2]
	Total Chlordane[3]		Required	Required	Required[1]	TBD[2]
	2,4’-DDD	Required	Required	Required		Required
	2,4’-DDE	Required	Required	Required		Required
	2,4’DDT	Required	Required	Required		Required
	4 4'-DDD	Required	Required	Required		Required
	4,4'-DDE	Required	Required	Required		Required
	4,4'-DDT	Required	Required	Required		Required
	Dieldrin	Required	Required	Required		TBD[2]
	alpha-Endosulfan				Required[1]	TBD[2]
	beta-Endosulfan				Required[1]	TBD[2]
	Endosulfan sulfate				Required[1]	TBD[2]
	Endrin				Required[1]	TBD[2]
	Endrin aldehyde				Required[1]	TBD[2]
	Heotachlor				Required[1]	TBD[2]
	Heptachlor Epoxide				Required[1]	TBD[2]

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	Toxaphene	Required	Required	Required		TBD[2]
Polychlorinated Biphenyls (PCBs)[4]	Aroclor-1016				Required[1]	TBD[2]
	Aroclor-1221				Required[1]	TBD[2]
	Aroclor-1232				Required[1]	TBD[2]
	Aroclor-1242				Required[1]	TBD[2]
	Aroclor-1248				Required[1]	TBD[2]
	Aroclor-1254				Required[1]	TBD[2]
	Aroclor-1260				Required[1]	TBD[2]
	CL3-PCB-18	Required	Required	Required		
	CL3-PCB-28	Required		Required		
	CL3-PCB-37	Required	Required	Required		
	CL4-PCB-44	Required	Required	Required		
	CL4-PCB-49	Required	Required	Required		
	CL4-PCB-52	Required	Required	Required		
	CL4-PCB-66	Required	Required	Required		
	CL4-PCB-70	Required	Required	Required		
	CL4-PCB-74	Required	Required	Required		
	CL4-PCB-77	Required	Required	Required		
	CL4-PCB-81	Required	Required	Required		
	CL5-PCB-87	Required	Required	Required		
	CL5-PCB-99	Required	Required	Required		
	CL5-PCB-101	Required	Required	Required		
	CL5-PCB-105	Required	Required	Required		
	CL5-PCB-110	Required	Required	Required		
	CL5-PCB-114	Required	Required	Required		
	CL5-PCB-118	Required	Required	Required		

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	CL5-PCB-119	Required	Required	Required		
	CL5-PCB-123	Required	Required	Required		
	CL5-PCB-126	Required	Required	Required		
	CL6-PCB-128	Required	Required	Required		
	CL6-PCB-138	Required	Required	Required		
	CL6-PCB-149	Required	Required	Required		
	CL6-PCB-151	Required	Required	Required		
	CL6-PCB-153	Required	Required	Required		
	CL6-PCB-156	Required	Required	Required		
	CL6-PCB-157	Required	Required	Required		
	CL6-PCB-158	Required	Required	Required		
	CL6-PCB-167	Required	Required	Required		
	CL6-PCB-168	Required	Required	Required		
	CL6-PCB-169	Required	Required	Required		
	CL7-PCB-170	Required	Required	Required		
	CL7-PCB-177	Required	Required	Required		
	CL7-PCB-180	Required	Required	Required		
	CL7-PCB-183	Required	Required	Required		
	CL7-PCB-187	Required	Required	Required		
	CL7-PCB-189	Required	Required	Required		
	CL8-PCB-194	Required	Required	Required		
	CL8-PCB-201	Required	Required	Required		
	CL9-PCB-206	Required	Required	Required		
Organophosphate Pesticides	Atrazine				Required[1]	TBD[2]
	Chlorpyrifos				Required[1]	TBD[2]
	Cyanazine				Required[1]	TBD[2]

Parameter group	Parameter	TMDL monitoring			Additional receiving water monitoring	MS4 Stormwater Outfall Monitoring
		Water	Sediment	Fish		
	Diazinon				Required[1]	TBD[2]
	Malathion				Required[1]	TBD[2]
	Prometryn				Required[1]	TBD[2]
	Simazine				Required[1]	TBD[2]
Herbicides	2,4-D				Required[1]	TBD[2]
	Glyphosate				Required[1]	TBD[2]
	2,4,5-TP-SILVEX				Required[1]	TBD[2]

Notes: 1) As specified in Order Number R4-2014-0024 Appendix D Part III Section B, monitoring must be conducted according to test procedures approved under 40 CFR Part 136 for the analysis of pollutants unless another test procedure is required under 40 CFR Subchapters N or O or is otherwise specified in this Order for such pollutants [40 CFR Sections 122.41(j)(4) and 122.44(i)(1)(iv)]. 2) See the CCMRP for reporting limits of the analytical parameters required as part of the Harbor Toxics TMDL compliance monitoring program and Table E-2 of Attachment E to the MS4 Permit for minimum levels of the additional parameters required to be monitored during the first wet and dry weather monitoring events as part of this IMP.

1 Constituents required by Table E-2 are only required for the first year monitoring events. For following year sampling events, those required will depend on if they meet the ML.

2 Constituents required by Table E-2 are only required if the lowest applicable water quality objective in the nearest downstream receiving water monitoring station is exceeded.

3 Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

4 PCB co-elutions will vary by instrument and column, and may increase reporting limits for some congeners.

6 Adaptive Management

The IMP will be reviewed on an annual basis to make any necessary adjustments to the monitoring sites, parameters, frequency of sampling, or sampling procedures. The IMP is intended to require modifications based upon annual monitoring results. Annual changes may include revisions in toxicity testing, parameters monitored at the receiving water monitoring sites, addition of new parameters to stormwater outfall sites, addition or relocation of monitoring sites, as well as a range of other program adjustments necessary to improve the ability of the program to monitor water quality improvements and identify major sources of contaminants in need of targeted control measures.

Waterbody-pollutant categories and the frequency of exceedance of available receiving water limitations are central to the monitoring approach. Pre-determined triggers will be used to determine if new parameters should be incorporated into the program or if monitoring of a parameter should be discontinued. Monitoring parameters will be adjusted based upon the following guidelines:

- Any parameter exceeding the minimum, appropriate water quality criteria listed in Appendix G during the wet and dry weather screening of Table E-2 parameters will be added to the monitoring list for the subject receiving water site and season.
- If a Table E-2 parameter exceeds receiving water criteria in two consecutive surveys, the parameter will be added to the monitoring list of the representative and associated upstream stormwater outfall monitoring site[s] for a minimum of 2 years.
- If monitoring results of a Table E-2 parameter that was added to a stormwater outfall monitoring site indicate the parameter is not detected in excess of the lowest applicable water quality criterion for 2 consecutive years, monitoring of that parameter at the stormwater outfall monitoring site will be discontinued.
- Pollutants in waterbody/classification 3 will be removed from the list of monitored parameters at a stormwater outfall monitoring site if they are not detected at levels that exceed the minimum, appropriate water quality criteria for a period of 2 consecutive years.

7 Aquatic Toxicity Testing and Toxicity Identification Evaluations

Aquatic toxicity testing includes the evaluation of receiving water samples for toxicity and may support the identification of compounds that elicit a toxic response. Once the toxicity is determined to be present and significant, the causative agent may be determined in a Toxicity Identification Evaluation (TIE) or other investigative action. After the causative agent(s) is identified a source analysis may be conducted to target BMPs to address the sources of toxicity. Receiving water samples are collected and analyzed twice per year in wet weather and once per year in dry weather and evaluated for toxicity. This section describes the testing program.

7.1 Sensitive Species Selection

Aquatic toxicity monitoring will be performed at receiving water monitoring stations CCMRP 16 and CCMRP 19, located in Long Beach Outer Harbor and East San Pedro Bay, respectively (Figure 2). Both stations are located in the marine environment. As described in the MRP, if samples are collected in receiving waters with salinity greater than or equal to 1 part per thousand (ppt), chronic toxicity testing will be conducted in accordance with test methods described in the *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136; USEPA 1995). Acceptable marine toxicity tests and species identified in the MRP include:

- A static renewal toxicity test with the topsmelt*, Atherinops affinis (*Larval Survival and Growth Test Method 1006.01)
- A static non-renewal toxicity test with the purple sea urchin, *Strongylocentrotus purpuratus* (Fertilization Test Method 1008.0)
- A static non-renewal toxicity test with the giant kelp*, Macrocystis pyrifera* (Germination and Growth Test Method 1009.0)

All three test species were evaluated to determine the most appropriate test species for the evaluation of toxicity in marine receiving water samples. Wet weather conditions in the region generally persist for less than the chronic testing period for *A. affinis* (7 days); therefore, this test is not representative of conditions found in the receiving water. In addition, the chronic TIE for this species is limited by logistical constraints (e.g., daily renewals of test solution, volume requirements); therefore, only the acute TIE could be performed. Alternatively, chronic toxicity tests with *S. purpuratus* and *M. pyrifera* are much shorter in duration (40 minutes and 48 hours, respectively) and consistent with the relatively shorter exposure periods introduced during storm events. With the shorter duration, a TIE can be initiated much quicker, reducing the holding time and potential for loss of toxicity due to extended sample storage. In chronic toxicity tests, *S. purpuratus* have been shown to be sensitive to metals (Tellis et al. 2014[1]), which are a primary pollutant in urban runoff for wet and dry weather. *S. purpuratus* demonstrate more sensitivity to metals than *M. pyrifera* exposed in chronic toxicity tests (Anderson and Hunt 1988[2]). In addition, *S. purpuratus* can be field collected and held in the laboratory for an extended period of time, making them readily available for storm water testing. Based on these factors, toxicity testing will be conducted with *S. purpuratus*. Because of seasonality in gamete availability, an alternative echinoderm species (sand dollar, *Dendraster excentricus*) may be substituted for *S. purpuratus* if gravid urchins are unavailable, as described in Test Method 1008.0.

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[1] Tellis, M. S., Lauer, M. M., Nadella, S., Bianchini, A., and Wood, C. M., 2014. Sublethal mechanisms of Pb and Zn toxicity to the purple sea urchin (Strongylocentrotus purpuratus) during early development. Aquatic Toxicology,146, 220-229.

[2] Anderson, B.S., and Hunt, J.W., 1988. Bioassay methods for evaluating the toxicity of heavy metals, biocides and sewage effluent using microscopic stages of giant kelp Macrocystis pyrifera (Agardh): A preliminary report. Marine environmental research, 26:113 -134 Source: Marine environmental research (1988) volume: 26 issue: 2 page: 113 -134

7.2 Testing Period

The testing period for the chronic toxicity tests with *S. purpuratus* is 40 minutes, which is consistent with the relatively shorter exposure periods introduced during storm events. As previously discussed, the shorter duration of this test allows a TIE to be initiated quickly if necessary, reducing the holding time and potential for loss of toxicity due to extended sample storage. Chronic testing with *S. purpuratus* will be conducted in accordance with *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms* (USEPA 1995).

7.3 Toxicity Endpoint Assessment and Toxicity Identification Evaluation Triggers

The chronic toxicity test endpoint will be analyzed, per the MRP, using the U.S. Environmental Protection Agency's (USEPA's) Test of Significant Toxicity (TST) approach (USEPA 2010) as required in the MRP. The MRP specifies that the chronic in-stream waste concentration (IWC) is set at 100 percent receiving water for receiving water samples. TST passage or failure will be determined based on USEPA's TST Implementation Document (USEPA 2010) at a percent effect value equal to or greater than 50 percent at 100 percent receiving water as specified in the MRP. Although the TST approach requires only control and 100 percent receiving water sample, a full dilution series will be tested to estimate the degree of toxicity. This is because USEPA Region IX recently withdrew its approval of use of two concentrations of a control and an IWC (i.e., 100 percent receiving water) in lieu of the five concentrations plus a control when using the TST approach.[3] Therefore, use of a five dilution series plus a control is required for toxicity testing even when using the TST. Federal regulations prohibit any modification of a USEPA-approved CWA analytical method [40 C.F.R. §136.6(b)(3)].

A control and five concentrations will be tested (e.g., 100, 75, 50, 25, and 12.5 percent). In addition to the TST outcome (pass or fail), statistical analysis will be performed using the Comprehensive Environmental Toxicity Information System (CETIS). The statistical output will include the No Observed Effect Concentration (NOEC), Lowest Observed Effect Concentration (LOEC), and Median Effective Concentration (EC_{50}). These non-TST endpoints are currently used for USEPA approved toxicity test methods. These endpoints will be useful to validate and support the outcome of the TST. The TST outcome will provide only pass or fail. If a fail is determined, the non-TST endpoints will provide useful information regarding the level of toxicity observed to qualify and/or validate the TST outcome. In addition, toxicity monitoring results from the IMP can be compared to historical toxicity data in Long Beach Harbor water and eastern San Pedro Bay and to data from other toxicity monitoring programs using these non-TST endpoints in order to understand temporal and spatial trends.

[3] USEPA Region IX February 11, 2015. A letter to Renee Spears at State Water Resources Control Board written by Eugenia McNaughton at USEPA Region IX. Previously, USEPA sent a letter approving a use of a control and an IWC as alternative test procedure (ATP) in lieu of multiple dilution series when using the TST to respond the request from the State Water Resource Control Board. However, USEPA in its February 11, 2015 letter, withdrew its approval. This letter also states that USEPA proposed a rulemaking to revise 40 CFR § 136 in order to limit authority of an approval of ATP only to Regional ATP Coordinator. If the rulemaking is completed, only a USEPA Regional ATP Coordinator will be allowed to approve an ATP and a permitting authority will be no longer allowed to approve an ATP.

A Toxicity Identification Evaluation (TIE) will be triggered to identify the cause of toxicity if fertilization endpoint demonstrates a percent effect value equal to or greater than 50 percent at the IWC.[4] TIE procedures will be initiated as soon as possible after the toxicity trigger threshold is observed to reduce the potential for loss of toxicity due to extended sample storage.

In cases where significant endpoint toxicity effects in excess of 50% are observed in the original sample, but the follow-up TIE baseline test is found to not be statistically significant, the cause of toxicity will be considered non-persistent, and no immediate follow-up testing will be required on the sample. However, future test results will be evaluated to determine if implementation of concurrent TIE treatments is needed to provide an opportunity to identify the cause of toxicity.

7.4 Toxicity Identification Evaluation Approach

The results of toxicity testing will be used to trigger further investigations to determine the cause of observed laboratory toxicity. The primary purpose of conducting TIEs is to support the identification of management actions that will result in the control of pollutants causing toxicity in receiving waters. Successful TIEs will direct monitoring at outfall sampling sites to inform management actions. As such, the goal of conducting TIEs is to identify pollutant(s) that should be sampled during outfall monitoring so that management actions can be identified to address the pollutant(s).

The TIE approach as described in *Methods for Aquatic Toxicity Identification* (USEPA 1991) is divided into three phases, although some elements of the first two phases are often combined. Each of the three phases is briefly summarized below:

- Phase I describes methods to characterize the physical/chemical nature of the constituents that cause toxicity. Such characteristics as solubility, volatility, and filterability are determined without specifically identifying the toxicants. Phase I results are intended as a first step in specifically identifying the toxicants, but the data generated can also be used to develop treatment methods to remove toxicity without specific identification of the toxicants.
- Phase II describes methods to specifically identify toxicants.
- Phase III describes methods to confirm the suspected toxicants.

A Phase I TIE will be conducted on samples that exceed the TIE trigger described in Section7.3. Water quality data will be reviewed to support evaluation of potential toxicants. A range of sample manipulations may be conducted as part of the TIE process. The most common manipulations are described in Table 5. Information from previous chemical testing and/or TIE efforts will be used to determine which of these (or other) sample manipulations are most likely to provide useful information for identification of primary toxicants. TIE methods will generally adhere to USEPA procedures documented in conducting TIEs (USEPA 1991, 1992, 1993a, 1993b).

[4] Difference between mean control and mean IWC response, divided by the mean control response, multiplied by 100

Table 5. Phase I and II Toxicity Identification Evaluation Sample Treatments.

TIE Sample Treatment	Description
Baseline (no manipulation)	For comparing changes in toxicity in other manipulations and evaluating changes in toxicity during storage
Graduated pH test	pH is adjusted to determine if toxicity can be attributed to compounds whose toxicity is pH-dependent (e.g., ammonia, some trace metals)
Filtration test	Particulate-associated toxicants are physically removed by filtration
Aeration test	Sample is aerated to evaluate effects of volatile toxicants (e.g., organic solvents)
Ethylenediamine-Tetraacetic Acid (EDTA) addition test	A chelating compound; EDTA reduces toxicity caused by cationic metals
Sodium thiosulfate (STS) addition test	Reduces toxicity caused by oxidants (i.e., chlorine) and some trace metals
Piperonyl Butoxide (PBO) addition test	Reduces toxicity caused by organophosphate pesticides (i.e., diazinon, chlorpyrifos, malathion) and enhances toxicity caused by pyrethroids
Carboxylesterase addition	Removes toxicity caused by pyrethroids
Solid Phase Extraction (SPE) with C18 column	Removes non-polar organics
Methanol Eluate test	Methanol is used to elute the C18 column to recover toxicants and confirm toxicity

The City will identify the cause(s) of toxicity using a selection of treatments in Table 5, and if possible, using the results of water column chemistry analyses. After any initial assessments of the cause of toxicity, the information may be used during future events to modify the targeted treatments to more closely target the expected toxicant or class of toxicants. Moreover, if the toxicant or toxicant class is not initially identified, toxicity monitoring during subsequent events will confirm whether the toxicant is persistent or a short-term episodic occurrence.

As the primary goals of conducting TIEs is to identify pollutants for incorporation into outfall monitoring, narrowing the list of toxicants following Phase I TIEs via Phase II/III TIEs is not necessary if the toxicant class determined during the Phase I TIE is sufficient for 1) identifying additional pollutants for outfall monitoring; and/or 2) identifying control measures. Thus, if the specific pollutant(s) or classes of pollutants (e.g., metals) are identified, then sufficient information is available to incorporate the additional pollutants into outfall monitoring and to start implementation of control measures to target the additional pollutants.

Phase II TIEs may be utilized to identify specific constituents causing toxicity in a given sample if the results of Phase I TIE testing and a review of available chemistry data fail to provide information necessary to identify constituents that warrant additional monitoring activities or management actions to identify likely sources of the toxicants and lead to elimination of the sources of these contaminants. Phase III TIEs will be conducted, as necessary, following any Phase II TIEs.

TIEs will be considered inconclusive if 1) the toxicity is not persistent; and 2) the cause of toxicity cannot be attributed to a class of constituents (e.g., pesticides, metals) that can be targeted for monitoring.

The TIE is considered conclusive if:

- A combination of causes that act in a synergistic or additive manner are identified
- Toxicity can be removed with a treatment or combination of the TIE treatments
- Analysis of water quality data collected during the same event identifies the pollutant or analytical class of pollutants

7.5 Discharge Assessment

The City will prepare a brief Discharge Assessment Plan if TIEs conducted on consecutive sampling events are inconclusive. The discharge assessment will be conducted after consecutive inconclusive TIEs rather than after one because of inherit variability associated with the toxicity and TIE testing methods.

The Discharge Assessment Plan will consider the observed potential toxicants in the receiving water and associated urban runoff discharges, known species effect levels, and relevant exposure periods. The Discharge Assessment Plan will reexamine the following issues:

- Is additional receiving water toxicity monitoring necessary to better evaluate the spatial extent of receiving water toxicity?
- Should different test species be considered? If a species is proposed that is different than the species utilized when receiving water toxicity was observed, justification for the substitution will be provided.
- Is the number and location of monitoring sites suitable for understanding the observed receiving water toxicity?
- What program adjustments are necessary to facilitate a better understanding of the cause of toxicity? Examine the number of monitoring events to be conducted, a schedule for conducting the monitoring, and a process for evaluating the completion of the assessment monitoring.

The Discharge Assessment Plan will be submitted to Los Angeles Regional Water Board for comment within 60 days of receipt of notification of the second consecutive inconclusive result. If no comments are received within 30 days, it will be assumed that the approach is appropriate for the given situation and the Plan should be implemented within 90 days of submittal.

7.6 Follow Up on Toxicity Testing Results

The MRP indicates the following actions should be taken when a toxicant or class of toxicants is identified through a TIE:

1. Group members shall analyze for the toxicant(s) during the next scheduled sampling event in the discharge from the outfall(s) upstream of the receiving water location.

2. If the toxicant is present in the discharge from the outfall at levels above the applicable receiving water limitation, a toxicity reduction evaluation (TRE) will be performed for that toxicant.

The list of constituents monitored at outfalls identified in the IMP will be modified based on the results of the TIEs. Monitoring for those constituents will occur as soon as feasible following the completion of a successful TIE (i.e., the next monitoring event that is at least 45 days following the toxicity laboratory's report transmitting the results of a successful TIE).

The requirements of the TREs will be met as part of the adaptive management process in the WMPs rather than the IMP. The identification and implementation of control measures to address the causes of toxicity are tied to management of the stormwater program, not the IMP. It is expected that the requirements of the TREs will only be conducted for toxicants that are not already addressed by an existing Permit requirement (e.g., TMDLs) or existing or planned management actions.

8 Monitoring Methodology

8.1 Aquatic Toxicity Testing Method

During the first year of monitoring, chronic toxicity testing will be performed using *S. purpuratus*. Toxicity testing will be performed on a control and five concentrations (e.g., 100, 75, 50, 25, and 12.5 percent). Table 6 provides sample volumes necessary for toxicity tests (both wet and dry weather) as well as minimum volumes necessary to fulfill Phase I TIE testing if necessary. As detailed in the previous section, the fertilization endpoint will be assessed using the USEPA's TST procedure and CETIS to determine if there is a 50% difference between sample controls and the test waters and ultimately determine if further testing is necessary.

Table 6. Toxicity Test Volume Requirements for Aquatic Toxicity Testing

Test Organism	Toxicity Test Type	Test Concentration	Volume Required for Initial Test (L)	Minimum Volume Required for TIE (L)[1]
Marine Tests for Samples with Salinity ≥ 1.0 ppt				
Purple sea urchin (*Strongylocentrotus purpuratus*)	Fertilization test	0, 12.5, 25, 50, 75 and 100%	1	10

Notes:

The National Pollutant Discharge Elimination System permit targets a 36-hour holding time for initiation of testing but allows a maximum holding time of 72 hours if necessary.

1 Minimum volume for TIE is for Phase 1 only

8.2 Receiving Water monitoring

As specified in Appendix E – Monitoring and Reporting Program – Section IV.A.3, the IMP may be coordinated with other sampling programs to leverage resources. This section provides a summary of receiving water, sediment, and tissue monitoring methodology proposed for the City's IMP, which is based on the CCMRP that was developed to satisfy the Harbor Toxics TMDL compliance monitoring program. The CCMRP was approved by the Regional Board on June 6, 2014. Implementation of the CCMRP satisfies the TMDL compliance monitoring requirements.

As presented previously (see Section 4), the TMDL compliance monitoring program contains a subset of analytical parameters required, at a minimum, for the first wet and dry weather receiving water quality monitoring events. Implementation of the IMP will require these additional analytical parameters to be tested at the frequency specified in the permit.

8.2.1 Water

Receiving water quality monitoring consists of in situ measurements and the collection of water samples for chemical analyses.

8.2.1.1 In Situ Measurements

For each sampling event and at each station, water depth and in situ[5] water quality parameters (temperature, dissolved oxygen [DO], pH, and specific conductance [or salinity]) will be collected. Water quality parameters and water depth will be recorded on a field data sheet.

The water depth at each station should be recorded using a probe or lead line. Water quality will be measured in situ at the station by immersing a multi-parameter instrument[6] into the water at the same location where the water sample is collected. The instrument must equilibrate for at least 1 minute before collecting temperature, pH, conductivity, and/or salinity measurements, and at least 90 seconds before collecting DO measurements. Because DO takes the longest to stabilize, this parameter will be recorded after temperature, pH, and salinity. In situ measurements will follow Standard Operating Procedures (SOPs) identified in the Surface Water Ambient Monitoring Program (SWAMP; MPSL-DFG 2007). SOPs developed in support of the CCMRP may also be referenced. Water quality measurements will be collected at three depths during wet and dry weather events (surface, mid-water column, and bottom).

The MS4 Permit states that flow also be included as a parameter to be measured. At the point of a stormwater or dry weather discharge, it is appropriate to measure for flow. In these cases, flow measurements (i.e., the volume of water discharged per unit of time from a specific discharge point) may be used to calculate suspended sediment and pollutant loadings to a receiving waterbody. In contrast, at stations within a receiving waterbody, it is not appropriate to measure flow for two primary reasons:

- Tidal and wind currents (in bays and estuaries) or flows originating from upstream sources (in rivers and channels) will cause inaccurate flow measurements of the discharge after it mixes with receiving water.
- Mixing of the discharge with receiving water prevents calculations of loadings (i.e., the pollutant concentration multiplied by flow measurement) because the discharge and its suspended sediment and pollutant load is immediately diluted in the receiving water.

This IMP proposes to sample at locations within receiving waters. As such, flow will not be measured, because mixing and other hydrodynamic factors will confound the flow measurements and loading calculations.

[5] Water quality parameter measurements may be taken in the laboratory immediately following sample collection if auto-samplers are used for sample collection or if weather conditions are unsuitable for field measurements.

[6] A multi-parameter instrument is preferred; however, multiple specific water quality parameter meters may also be used.

8.2.1.2 Grab Samples

Grab samples (i.e., instantaneous, not time- or flow-weighted composites) for analytical chemistry and bacteriological analyses will be taken only from the surface (upper 1 meter of water column) during wet and dry weather events. Multiple grab samples may be required at each station in order to provide sufficient water volume to complete all analyses required. Water samples will be collected with a grab sampler (e.g., Niskin or Van Dorn) that has been decontaminated prior to sample collection at each station. Sampling methods will generally conform to the USEPA's clean sampling methodology described in the SWAMP SOP (MPSL-DFG 2007). SOPs developed in support of the CCMRP may also be referenced.

Sample processing and handling for water chemistry will be conducted in accordance with guidance developed in the Quality Assurance Management Plan for the State of California's SWAMP (Pucket 2002). Aliquots for all required parameters will be taken directly from the grab sampler into appropriate containers or bottles. Water samples will be preserved, depending on the type of analysis, in the field in order to meet specified holding time. Water samples will be stored at less than 4°C until delivery to the appropriate analytical laboratory.

8.2.2 Sediment

Surface sediment samples will be collected at each station. Multiple grab samples may be required at each station in order to provide sufficient sediment volumes to complete all analyses required for the Sediment Quality Objective (SQO) Part 1 assessment (Bay et al. 2009). Sediment grabs will be evaluated for acceptance as outlined in the Bight Field Operations Manual, Section VIII (BCEC 2008).

Surface sediment grab sample procedures will be collected using a Van Veen sampler or similar sampling device as appropriate for the type of sediment sample being collected, as described in the Bight Field Operations Manual, Section VIII (BCEC 2008). SOPs developed in support of the CCMRP may also be referenced.

Sediment sample processing and handling for purposes of sediment chemical analyses, sediment toxicity, and benthic community assessment in support of the SQO Part 1 assessment will be performed in accordance with procedures specified in the Sediment Quality Assessment Draft Technical Support Manual (Bay et al. 2009) and the Bight Field Operations Manual (BCEC 2008). SOPs developed in support of the CCMRP may also be referenced. Sediment samples for chemistry and toxicity analyses will be stored at less than 4°C until delivery to the appropriate analytical laboratory. Benthic infauna samples will be stored in 10 percent buffered formalin in the short term and then subsequently transferred to 70 percent ethanol (or equivalent) for long-term storage.

8.2.3 Fish Tissue

Fish tissue samples will be collected and analyzed for chemical contaminants of concern. Sampling, processing, and testing methods will be carried out in accordance with Bight protocols (BCEC 2008, 2009). SOPs developed in support of the CCMRP may also be referenced. Necessary permits (e.g., scientific collection, incidental take) will be secured prior to fish collection. Applications and procedures for permits can be found online at the California Department of Fish and Wildlife (CDFW) website (CDFW 2013).

CDFW code section 1002 and Title 14 sections 650 and 670.7 requires a Scientific Collecting Permit to take, collect, capture, mark, or salvage, for scientific purposes, fish and invertebrates. CDFW section 2081(b) requires an Incidental Take Permit (ITP) for any species listed as threatened or endangered (T/E). Although none of the targeted species for this study are T/E species, it is possible that T/E species will be accidentally caught as by catch. An ITP is required for T/E species that are caught or handled in any way, even if they are returned to the ocean.

In addition, the permit holders must notify the local CDFW office prior to collection and submit a report of the animals taken under the permits within 30 days of the expiration date of the permits.

Composite samples of three fish species (white croaker, California halibut, and shiner surfperch) will be collected at two locations, one in eastern San Pedro Bay and one in Outer Long Beach Harbor.

When possible, fish will be collected using a semi-balloon, 7.6-meter headrope otter trawl following the methods in the Bight Field Operations Manual (BCEC 2008). If other methods need to be employed in the case that an otter trawl is not feasible (e.g., lampara net, beach seine, fish trap, or hook and line), SWAMP methods will be used (MPSL-DFG 2001). SOPs developed in support of the CCMRP may also be referenced.

Once the catch is onboard the vessel, the targeted species will be identified and separated for subsequent processing. At each station, 12 individuals of each fish species will be collected for further processing. There is currently no legal size limit for white croaker. An ocean fish contaminant survey was performed from 2002 to 2004 (NOAA 2007). In part, this survey sought to generate information on contaminants of concern for fish caught for sustenance in Southern California. Collection of white croaker for the Harbor Toxics TMDL study should be consistent with this survey, which recommended a minimum length of 160 millimeters (mm; total length). Collection of California halibut of legal size limit is preferred. The current regulations specify at least 22 inches (or 559 mm; total length) for California halibut (FGC 2012). Collection of adult shiner surfperch (i.e., second year age-class with a target length of 88 mm [Odenweller 1975]) is preferred. Additional individuals of the three target species and non-target species will be returned to the ocean as soon as possible to minimize loss. It should be noted that field personnel may encounter by catch species that are potentially harmful while sorting for targeted species. The Bight Field Operations Manual (BCEC 2008) and Fish Collection SOPs in Appendix A provide information on the safe handling of these organisms.

Each targeted fish kept will be tagged with a unique identification number and then measured for total length, fork length, and weight, and examined for gross pathology in accordance with guidance established in the Bight Field Operations Manual (BCEC 2008). Three composite samples per species per station will be created. A composite sample will be composed of four individuals; therefore, a total of 12 individuals per station are required. If more than 12 specimens are caught, then the 12 individuals best and most closely distributed about the 75th percentile of the length distribution of all individuals will be used for the composites. The selected 12 individual fish will then be arranged by size and the smallest four fish, the middle four fish, and the largest four fish within a species will be grouped for each composite to satisfy the 75 percent rule (the smallest individual in a composite is no less than 75 percent of the total length of the largest individual in a composite; USEPA 2000). This may permit data evaluation based on size class, if necessary. Skin-off fillets will be used for white croaker, California halibut, and shiner surfperch to be consistent with the *2002 – 2004 Southern California Coastal Marine Fish Contaminants Survey* (NOAA 2007). Dissection and compositing methods will be performed in the analytical laboratory in accordance with USEPA guidance (USEPA 2000).

Fish tissue will be analyzed for chemical parameters. Processing and preservation will be performed in accordance with the methods described in the Bight Field Operations Manual and Bioaccumulation Workplan (BCEC 2008, 2009). Fish will be processed in the field according to the steps below.

- Sacrifice fish and leave whole body intact.
- Blot fish dry and pack each fish in aluminum foil (shiny side out).
- Place each packed fish in a labeled, food-grade, resealable plastic bag and store on ice.
- Ship overnight to the analytical laboratory on wet or blue ice. If samples are held more than 24 hours, pack on dry ice.

Chain-of-custody forms will be maintained. Tissue compositing will be conducted by the analytical laboratory.

8.3 Stormwater Outfall monitoring

This section provides a summary of the stormwater outfall monitoring methodology proposed for the City's IMP. A Sampling and Analysis Plan will be developed, detailing specific methods for collection of stormwater samples within the Port of Long Beach.

8.3.1 In Situ Measurements

For each sampling event and at each station, in situ[7] water quality parameters (temperature, DO, pH, and specific conductance [or salinity]) will be collected. Water quality parameters will be recorded on a field data sheet.

Water quality will be measured in situ at the station by immersing a multi-parameter instrument[8] into the water at the same location where the water sample is collected or, dependent on flow, into a sample bottle containing the stormwater discharge. The instrument must equilibrate for at least 1 minute before collecting temperature, pH, and conductivity and at least 90 seconds before collecting DO measurements. Because DO takes the longest to stabilize, this parameter will be recorded after temperature, pH, and salinity. In situ measurements will follow SOPs identified in the Surface Water Ambient Monitoring Program (MPSL-DFG 2007).

8.3.2 Sampling Methodology

Flow-weighted composite samples will be collected during the first 24 hours of stormwater discharge or for the entire storwmater discharge if it is less than 24 hours. Grab samples, if necessary, will be collected for parameters not amenable to flow-weighted composite sampling.

Where feasible, sites will be set up to be completely automated for continuous data collection and sample collection. Flow rates will be monitored using ISCO (or comparable) flowmeters with an ultrasonic sensor, bubbler, or submerged pressure transducer as the primary level measuring device. Flow rates will be measured or estimated in accordance with the National Pollutant Discharge Elimination System (NPDES) Storm Water Sampling Guidance Document (EPA-833-B-92-001). The flowmeter will continuously measure level and calculate flow rates to actuate the automated sampler to achieve a flow-weighted sample.

Flow-weighted composite samples will be collected by taking sample aliquots across the hydrograph of the storm event. Based on the anticipated size of the storm, a flow-proportioned pacing will be programmed into the automated sampling equipment. The first sample aliquot will be taken at or shortly after the time that storm water runoff begins, and each subsequent aliquot of equal volume will be collected every time the pre-selected flow volume (flow-proportional pacing) discharges past the monitoring station. Individual flow-weighted sample aliquots will be collected sample approximately every 15 minutes. Some variation may occur depending on actual storm intensity and duration. Short duration storms will have more frequent sampling intervals where longer duration storms will have longer intervals, respectively. Sample pacing worksheets will be developed for each site based on a

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[7] Water quality parameter measurements may be taken in the laboratory immediately following sample collection if auto-samplers are used for sample collection or if weather conditions are unsuitable for field measurements.

[8] A multi-parameter instrument is preferred; however, multiple specific water quality parameter meters may also be used.

predicted precipitation size such that sufficient sample volume will be collected to analyze the required analytical methods desired.

Flow-weighted samples will be collected using an ISCO (or comparable) autosampler connected to 0.375-inch diameter Teflon lined tubing and a stainless steel (or Teflon) sample strainer. The sample strainer will be mounted at the point of discharge to ensure that the strainer remains submerged during sample flows to ensure sufficient volume during pumping and above tidally influenced waters within the storm drain system.

SOPs will be prepared to ensure field staff use standardized programming methods. The SOPs will be developed following the instrument manufacturer's recommendations for flow-weighted sample collection. If grab samples are necessary, samples will be collected manually with certified clean sample containers, taking care not to bias the sample during sample collection.

Sample processing and handling for water chemistry will be conducted in accordance with guidance developed in the Quality Assurance Management Plan for the State of California's SWAMP (Pucket 2002). Samples will be preserved, depending on the type of analysis, in the field in order to meet specified holding times. Water samples will be stored at less than 4 °C until delivery to the appropriate analytical laboratory. Samples for all required parameters will be taken from the flow-weighted composite at the laboratory.