Transitional Receiving Water Monitoring

Work Plan

Prepared for:

San Diego County Regional Copermittees

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2007 Permit	RWQCB Order No. R9-2007-0001
2013 Permit	RWQCB Order No. R9-2013-0001
ADCP	Acoustic Doppler Current Profiler
AFDM	ash-free dry mass
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BMI	benthic macroinvertebrate
BOD	biochemical oxygen demand
BSA	bovine serum albumin
CDFG	California Department of Fish and Game
COC	chain of custody
cm2	square centimeter
CRAM	California Rapid Assessment Method
CSBP	California Stream Bioassessment
DO	Dissolved oxygen
EDTA	ethylenediaminetetraacetic acid
ELAP	Environmental Laboratory Accreditation Program
GIS	geographic information system
IBI	Index of Biotic Integrity
m	meter
mL	milliliter
MLS	Mass Loading Stations
mm	millimeter
MS4	municipal separate storm sewer system
NOAA	National Oceanic and Atmospheric Administration
PBO	piperonyl butoxide
pH	hydrogen ion concentration
PHAB	Physical Habitat
PVC	polyvinyl chloride
O/E	observed to expected
QA	quality assurance
QC	quality control
RWQCB	Regional Water Quality Control Board
SAFIT	Southwest Association of Freshwater Invertebrate Taxonomists
SCAMIT	Southern California Association of Marine Invertebrate Taxonomists
SCCWRP	Southern California's Coastal Water Research Project
SMC	Stormwater Monitoring Coalition
SOP	standard operating procedure
SPE	solid phase extraction
STS	sodium thiosulfate
SWAMP	Surface Water Ambient Monitoring Program
TAC	Technical Advisory Committee

TIE	toxicity identification evaluation
TSS	total suspended solids
TWAS	Temporary Watershed Assessment Stations
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
WEF	Water Environment Federation
WESTON®	Weston Solutions, Inc.
WMA	Watershed Management Area

1.0 INTRODUCTION

The purpose of this work plan is to describe the methods and procedures for the 2013-2014 and 2014-2015 transitional receiving water monitoring and the long-term receiving water monitoring required by the San Diego Regional Water Quality Control Board (RWQCB) Order No. R9-2013-0001 (2013 Permit). Receiving water monitoring conducted by the San Diego County Regional Copermittees (Copermittees) will be conducted in the southern section of San Diego County (County) during the 2013-2014 monitoring season and the northern section of the County during the 2014-2015 monitoring season.

1.1 Outline of Activities

During the 2013–2014 monitoring season, Weston Solutions, Inc. (WESTON®) will conduct the following to satisfy the requirements of the Monitoring and Assessment Program Section of the 2013 Permit:

- Transitional receiving water monitoring at Mass Loading Stations (MLS) and Temporary Watershed Assessment Stations (TWAS) in accordance with the 2013 Permit (D.1.a.(1)), referencing the continuation of the receiving water monitoring required by the RWQCB Order No. R9-2007-0001 (2007 Permit).
- Long-term receiving water monitoring at four southern MLS in accordance with the 2013 Permit (D.1.b, c, and d).
- Post-storm sediment pyrethroid monitoring in accordance with the 2007 Permit (Section II.A.7).
- Toxicity identification evaluations (TIEs) in accordance with the 2007 Permit (Section II.A.4).
- Dry weather hydromodification monitoring in accordance with the 2013 Permit (D.1.c.(6)).
- Rapid stream bioassessment and Stormwater Monitoring Coalition (SMC) regional monitoring surveys in accordance with the 2013 Permit (D.1.a.(1), D.1.a.(3)(a), D.1.c.(5), and D.1.e.(1)(a)).

During the 2014–2015 monitoring season, WESTON will conduct the following activities to satisfy the requirements of the Monitoring and Assessment Program Section of the 2013 Permit:

- Transitional receiving water monitoring at MLS and TWAS in accordance with the 2013 Permit (D.1.a.(1)), referencing the continuation of the receiving water monitoring as required by the 2007 Permit.
- Long-term receiving water monitoring at five northern MLS in accordance with the 2013 Permit (D.1.b, c, and d).
- Post-storm sediment pyrethroid monitoring in accordance with the 2007 Permit (Section II.A.7).
- Toxicity investigation evaluations (TIEs) in accordance with the 2007 Permit (Section II.A.4).

- Dry weather hydromodification monitoring in accordance with the 2013 Permit (D.1.c.(6)).
- Rapid stream bioassessment and SMC regional monitoring surveys in accordance with the 2013 Permit (D.1.a.(1), D.1.a.(3)(a), D.1.c.(5), and D.1.e.(1)(a)).

Summaries of the sampling activities for the 2013-2014 and 2014-2015 monitoring seasons are shown in Table 1-1 and Table 1-2.

Table 1-1. Summary of Sampling Activities for 2013-2014 Monitoring Season

Watershed Management Area	Station ID	D.1.a Transitional Receiving Water Monitoring (R9-2013-0001)			D.1.b. Long Term Receiving Water Monitoring Stations (R9-2013-0001)		
		Two Dry Weather and Two Wet Weather Receiving Water Monitoring Events (R9-2007-0001)	Dry Weather Receiving Water Bioassessment Monitoring (R9-2007-0001)	Post-Storm Sediment Pyrethroid Monitoring (R9-2007-0001)	Additional chemistry and toxicity tests to satisfy D.1.c. and D.1.d., three Dry Weather and three Wet Weather Receiving Water Monitoring Events (R9-2013-0001)*	D.1.c.(5) Dry Weather Receiving Water Bioassessment Monitoring (R9-2013-0001)	D.1.c.(6) Dry Weather Receiving Water Hydromodification Monitoring (R9-2013-0001)
Mission Bay	TC-MLS	X	X	X	X	X	X
	MB-TWAS-1	X	X	X			
	MB-TWAS-2	X	X	X			
San Diego River	SDR-MLS	X	X	X	X	X	X
	SDR-TWAS-1	X	X	X			
	SDR-TWAS-2	X	X	X			
	SDR-TWAS-3	X	X	X			
San Diego Bay**	CC-SD8(1)	X	X	X			
	SR-MLS	X	X	X	X	X	X
	SR-TWAS-1	X	X	X			
	OR-TWAS-1	X	X	X			
Tijuana River	TJR-MLS	X	X	X	X	X	X
	TJ-TWAS-1	X	X	X			

*The effort for two of the three of the monitoring events will be covered by transitional monitoring conducted under D.1.a with additional chemistry and toxicity to satisfy D.1.b., D.1.c. and D.1.d.

**One long-term receiving water monitoring station is required by the 2013 Permit for each Watershed Management Area (WMA). The site may change as necessary to support the Water Quality Improvement Plan.

Table 1-2. Summary of Sampling Activities for 2014-2015 Monitoring Season

Watershed Management Area	Station ID	D.1.a Transitional Receiving Water Monitoring (R9-2013-0001)			D.1.b. Long Term Receiving Water Monitoring Stations (R9-2013-0001)		
		Two Dry Weather and Two Wet Weather Receiving Water Monitoring Events (R9-2007-0001)	Dry Weather Receiving Water Bioassessment Monitoring (R9-2007-0001)	Post-Storm Sediment Pyrethroid Monitoring (R9-2007-0001)	Additional chemistry and toxicity tests to satisfy D.1.c. and D.1.d., three Dry Weather and three Wet Weather Receiving Water Monitoring Events (R9-2013-0001)*	D.1.c.(5) Dry Weather Receiving Water Bioassessment Monitoring (R9-2013-0001)	D.1.c.(6) Dry Weather Receiving Water Hydromodification Monitoring (R9-2013-0001)
Santa Margarita River	SMR-MLS-2	x	x	x	x	x	x
San Luis Rey River	SLR-MLS	x	x	x	x	x	x
	SLR-TWAS-1	x	x	x			
	SLR-TWAS-2	x	x	x			
Carlsbad**	LA-TWAS-1	x	x	x			
	BVC-TWAS-1	x	x	x			
	AHC-MLS	x	x	x			
	SM-TWAS-1	x	x	x			
	EC-MLS	x	x	x	x	x	x
San Dieguito River	SDC-MLS	x	x	x	x	x	x
	SDC-TWAS-1	x	x	x			
	SDC-TWAS-2	x	x	x			
Los Peñasquitos	LPC-MLS	x	x	x	x	x	x
	LPC-TWAS-2	x	x	x			
	LPC-TWAS-3	x	x	x			
San Diego Bay	CC-SD8(1)	x	x	x			

*The effort for two of the three of the monitoring events will be covered by transitional monitoring conducted under D.1.a with additional chemistry and toxicity to satisfy D.1.b., D.1.c. and D.1.d.

**One long-term receiving water monitoring station is required by the 2013 Permit for each WMA. The site may change as necessary to support the Water Quality Improvement Plan.

2.0 MONITORING METHODS

The following sections describe the methods for each activity of the transitional receiving water monitoring and the long-term receiving water monitoring to fulfill the requirements of the Monitoring and Assessment Program Section of the 2013 Permit.

2.1 Monitoring Locations

The sampling locations for the 2013-2014 and 2014-2015 monitoring seasons are shown in Table 2-1 and Table 2-2 respectively.

Table 2-1. List of Mass Loading Station/Temporary Watershed Assessment Station Monitoring Locations for the 2013–2014 Monitoring Season

WMA	Watershed	Station ID	Latitude	Longitude	Cross Street Description	Land Use Description	Notes	Channel Type	Jurisdiction
Mission Bay	Tecolote Creek	TC-MLS	32.772933	-117.203064	Tecolote Bridge on Morena Boulevard, just north of Tecolote Drive (i.e., Seaworld Drive.)	Primarily residential with some industrial, commercial, and open space.	Historical MLS. Wet weather monitoring station only. Long-term receiving water monitoring station.	Concrete trapezoidal channel.	City of San Diego
		TC-MLS(upstream of diversion)	32.775645	-117.196506	Approximately 100 meters east of the end of Tecolote Road cul-de-sac.	Primarily residential with some industrial, commercial, and open space.	MLS used for dry weather monitoring due to diversion. Long-term receiving water monitoring station.	Concrete trapezoidal channel.	City of San Diego
Mission Bay	Rose Creek	MB-TWAS-1	32.816776	-117.222681	Where Santa Fe Street Bridge crosses Rose Creek	Primarily residential, open space, and public utilities	This TWAS provides additional spatial data for Mission Bay Watershed. Station captures both Rose Canyon and San Clemente Canyon drainages.	Natural channel	City of San Diego
Mission Bay	Tecolote Creek	MB-TWAS-2	32.797982	-117.189563	Just south of Mount Acadia Boulevard and Snead Avenue intersection.	Primarily residential.	This TWAS provides upstream data for comparison to MLS. Station is upstream from Tecolote Canyon Golf Course.	Natural channel with box channel and drop structure	City of San Diego
San Diego River	San Diego River	SDR-MLS	32.765240	-117.168617	Directly south of the Fashion Valley Trolley Station at the footbridge.	Primarily residential with some industrial, commercial, and open space.	Historical MLS. Station is co-located with a U.S. Geological Survey (USGS) gauging station. Long-term receiving water monitoring station.	Natural channel	City of San Diego
San Diego River	San Diego River	SDR-TWAS-1	32.783587	-117.104129	San Diego Mission Road Bridge	Residential, parks, and open space	Station will capture upstream influences to compare to other TWAS and MLS. Station may be influenced from backflows from ponding during storm events.	Natural channel with multiple pipes through bridge	City of San Diego
San Diego River	San Diego River	SDR-TWAS-2	32.839194	-117.024194	West Hills Parkway Bridge just north of Mission Gorge Road	Primarily residential, commercial and industrial, and open space.	Station will capture upstream influences to compare to other TWAS and MLS. Station is co-located with a USGS Gauging Station.	Natural channel	County of San Diego
San Diego River	San Diego River	SDR-TWAS-3	32.856457	-116.947221	Just west of Riverford Road Bridge and north of Woodside Avenue intersection.	Open space, residential, and commercial.	Uppermost station to compare to other TWAS and MLS. There may be sediment basins and diversions in areas near the river. Influences from construction activities may be measured in analytical results.	Natural channel	California Department of Fish and Game (CDFG), County of San Diego, Lakeside Land Company
San Diego Bay	Chollas Creek	CC-SD8(1)	32.70552	-117.121166	33rd and Steel Street	Primarily residential and commercial, some industrial and transportation.	Historical MLS. Wet weather monitoring station only.	Concrete Channel	City of San Diego
		CC-NF54	32.741374	-117.083543	Near 54th St. and Chollas Pkwy N.	Primarily residential and commercial, some industrial and transportation.	MLS used for dry weather monitoring.	Concrete Channel	City of San Diego
San Diego Bay	Sweetwater River	SR-MLS	32.650720	-117.063592	Plaza Bonita Road just south of Equitation Lane.	Primarily residential with some industrial, commercial, and open space.	Historical MLS. Long-term receiving water monitoring station.	Natural channel	City of Chula Vista

Table 2-1. List of Mass Loading Station/Temporary Watershed Assessment Station Monitoring Locations for the 2013–2014 Monitoring Season

WMA	Watershed	Station ID	Latitude	Longitude	Cross Street Description	Land Use Description	Notes	Channel Type	Jurisdiction
San Diego Bay	Sweetwater River	SR-TWAS-1	32.732796	-116.94025	Just east of Steel Canyon Bridge and south of Campo Road and Singer Lane intersection.	Parks and residential.	This TWAS provides upstream data for comparison to MLS.	Natural channel	Caltrans, County of San Diego
San Diego Bay	Otay River	OR-TWAS-1	32.588464	-117.071683	Otay River at the Beyer Boulevard Bridge.	Residential, commercial, some industrial, and open space.	This is the safest and most favorable downstream location for monitoring. Station at Hollister Street was vandalized (completely stolen in 2009).	Natural channel	City of San Diego
Tijuana River	Tijuana River	TJR-MLS	32.551306	-117.084050	Southernmost bridge over Tijuana River on Hollister Street.	Primarily open space, agriculture, and residential in the immediate vicinity. City of Tijuana is directly upstream.	Historical MLS. Long-term receiving water monitoring station.	Natural channel	City of San Diego
Tijuana River	Tijuana River	TJ-TWAS-1	32.60939	-116.47421	Campo Creek at Highway 94 just southwest of the railroad crossing.	Rural residential, residential, agriculture, open space, and some industrial.	This TWAS provides data on the east county community of Campo.	Natural channel	County of San Diego

Table 2-2. List of Mass Loading Station/Temporary Watershed Assessment Station Monitoring Locations for the 2014–2015 Monitoring Season

WMA	Watershed	Station ID	Latitude	Longitude	Cross Street Description	Land Use Description	Notes	Channel Type	Jurisdiction
Santa Margarita River	Santa Margarita	SMR-MLS-2	33.398142	-117.26273	De Luz Road Bridge over Santa Margarita Bridge	Open space, agricultural, residential	MLS located upstream of MCB Camp Pendleton. Long-term receiving water monitoring station.	Natural Channel	County of San Diego
San Luis Rey River	San Luis Rey River	SLR-MLS	33.2206476	-117.35825	Benet Road Bridge over San Luis Rey River	Open space, agricultural, residential	Historical MLS. Long-term receiving water monitoring station.	Natural Channel	City of Oceanside
San Luis Rey River	San Luis Rey River	SLR-TWAS-1	33.288139	-117.223009	Camino Del Rey Bridge and San Luis Rey River	Primary land use is agricultural and open space with some residential.	This TWAS will provide upstream data for comparison to MLS and different land use inputs.	Natural Channel	County of San Diego
San Luis Rey River	San Luis Rey River	SLR-TWAS-2	33.254913	-117.295159	San Luis Rey south of N River Road	Primary land use is rural residential and some agriculture and high density residential.	Continuing with the priorities discussed in other Technical Advisory Committees (TACs) and working groups, it was decided to put the TWAS in the Lower San Luis Rey River. This marks the end of the agricultural and rural residential land use in the San Luis Rey River and transitions to high density residential and commercial.	Natural Channel	City of Oceanside
Carlsbad	Loma Alta Creek	LA-TWAS-1	33.188289	-117.361644	East of Parkwood Ln Bridge and Evergreen Parkway and on West side of I-5 Freeway	Mix of public utilities, residential, commercial, and industrial.	TWAS for Loma Alta Creek.	Concrete Channel	City of Oceanside
Carlsbad	Buena Vista Creek	BVC-TWAS-1	33.18088	-117.3267	Immediately east of El Camino Real Bridge and just North of Haymar Drive	Primarily residential and commercial	TWAS for Buena Vista Creek.	Concrete Sides with Natural Bottom	City of Carlsbad
Carlsbad	Agua Hedionda Creek	AHC-MLS	33.1495195	-117.297082	El Camino Real and Cannon Blvd.	Primarily residential and commercial	Historical MLS.	Natural Channel	City of Carlsbad
Carlsbad	San Marcos Creek	SM-TWAS-1a	33.13053	-117.20037	At Discovery Street Bridge	Primarily residential and commercial	Wet weather monitoring station only.	Natural Channel	City of San Marcos
		SM-TWAS-1b	33.13166	-117.18687	Bridge at Via Vera Cruz	Primarily residential and commercial	Dry weather monitoring station only.	Natural Channel	City of San Marcos

Table 2-2. List of Mass Loading Station/Temporary Watershed Assessment Station Monitoring Locations for the 2014–2015 Monitoring Season

WMA	Watershed	Station ID	Latitude	Longitude	Cross Street Description	Land Use Description	Notes	Channel Type	Jurisdiction
Carlsbad	Escondido Creek	EC-MLS	33.0482901	-117.226032	El Camino Del Norte Bridge	Primarily residential, open space, and commercial	Historical MLS. Long-term receiving water monitoring station.	Natural Channel	City of San Diego
San Dieguito River	San Dieguito River	SDC-MLS	32.9990817	-117.205625	Via De La Valle just east of Morgan Run Golf Course	Residential and open space, some agriculture	Historical MLS. Long-term receiving water monitoring station.	Natural Channel	City of San Diego
San Dieguito River	San Dieguito River	SDC-TWAS-1	33.0434	-117.07538	W. Bernardo Road Bridge just north of Aguamiel Drive.	Primary land use is residential.	This TWAS captures the southern input to Lake Hodges. This TWAS provides upstream data for comparison to MLS and different land use from northern input.	Natural Channel	City of San Diego
San Dieguito River	San Dieguito River	SDC-TWAS-2	33.060656	-117.031108	Just north of Highland Valley Road and 1.1 miles east of Sycamore Creek Road Junction.	Primarily agricultural and open space.	This TWAS captures the northern (main) input to Lake Hodges. This TWAS will provide upstream data for comparison to MLS and different land use from southern input.	Natural Channel	County of San Diego
Los Peñasquitos	Los Peñasquitos Creek	LPC-MLS	32.9045977	-117.22262	Vista Sorrento Parkway just north of Sorrento Valley Blvd.	Residential, open space, commercial	Historical MLS. Long-term receiving water monitoring station.	Natural Channel	City of San Diego
Los Peñasquitos	Los Peñasquitos Creek	LPC-TWAS-2	32.94262	-117.084042	East of Springbrook Drive and south of Sabre Springs Parkway.	Primarily residential and commercial.	This TWAS provides upstream data for comparison to MLS.	Natural Channel	City of San Diego
Los Peñasquitos	Los Peñasquitos Creek	LPC-TWAS-3	32.94636	-117.2046	East of Carmel Country Rd at bridge below Caminito Radiante	Primarily residential and open space.	Station added in 2012-2013 to provide data for Carmel Creek.	Armored Rip Rap Channel	City of San Diego
San Diego Bay	Chollas Creek	CC-SD8(1)	32.70552	-117.121166	33rd and Steel Street	Primarily residential and commercial, some industrial and transportation.	Historical MLS. Wet weather monitoring station only.	Concrete Channel	City of San Diego
		CC-NF54	32.741374	-117.083543	Near 54th St. and Chollas Pkwy N.	Primarily residential and commercial, some industrial and transportation.	MLS used for dry weather monitoring.	Concrete Channel	City of San Diego

2.2 Transitional Receiving Water Monitoring and Long-Term Receiving Water Monitoring

Transitional receiving water monitoring at MLS and TWAS will be conducted in accordance with the 2013 Permit (D.1.a.(1)), referencing the continuation of the receiving water elements of the 2007 Permit. Long-term receiving water monitoring will also be conducted at one MLS in each Watershed Management Area (WMA), in accordance with the 2013 Permit (D.1.b, c, and d). The transitional receiving water stations include all MLS and TWAS. The nine long-term receiving water monitoring stations include the following: SMR-MLS-2, SLR-MLS, EC-MLS, SDC-MLS, LPC-MLS, TC-MLS, SDR-MLS, SR-MLS, and TJR-MLS. The 2013-2014 monitoring season will include monitoring in the southern WMAs (Mission Bay WMA to Tijuana River WMA), and the 2014-2015 monitoring season will include monitoring in the northern WMAs (Santa Margarita River to Los Peñasquitos, including Chollas Creek).

Seasonal mobilization and demobilization activities will include the following:

- MLS and TWAS will be installed and maintained to perform flow monitoring and sampling during the monitoring year (i.e., September 1 through approximately June 30).
- Flow monitoring data will be collected throughout the monitoring season to estimate the annual watershed loads.
- Stations will be removed at the end of the monitoring season (approximately June 30).
- Safety and quality are integral parts of the WESTON culture. Team safety meetings and quality reviews will be conducted to ensure that safe and reliable business practices are used during the performance of this program.

2.2.1 Flow Monitoring

Flow rates will be monitored using American Sigma (or comparable) flowmeters with an ultrasonic sensor, bubbler, or submerged pressure transducer as the primary measuring device. The primary sensor will continuously measure stage (i.e., stream height) and relay that information to the flowmeter. The flowmeter will continually calculate flow rates by inserting the stage information into the preprogrammed discharge equation. Using this system, the flowmeter will be able to actuate the sampler to achieve a flow-weighted composite sample. Sampling and flow equipment will be monitored remotely, and data will be transferred to a permanent data system by cellular modem or manual download.

The MLS and TWAS equipment installed and used for monitoring during dry weather will remain in place during the course of the monitoring year (except where stations are located specifically for dry weather only sampling). The monitoring year is approximately September 1 through June 30. Continual flow data will be downloaded remotely from each station once every 2 weeks to verify equipment functionality and thus to reduce data gaps, ensure accuracy, and identify maintenance and calibration needs. Flow data will be entered into the data management system. Equipment will be maintained throughout this period to ensure it is in proper working order.

2.2.1.1 Stream Ratings

The flow rate at each of the monitoring stations will be determined by stream stage (water level) sensors that are typically secured to the bottom of the channel. To quantify flow rates based on stream stage, a relationship between flow and stage will be derived using the standardized stream rating protocols developed by the U.S. Geological Survey (USGS) (Rantz, 1982; Oberg et al., 2005). Instantaneous flow measurements will be taken at various stages at each of the stations. The measurements will be combined to produce and calibrate the rating curve for each station.

To accurately measure flow in streams, the following three critical elements are needed to develop the rating curves:

- An accurate survey of the stream channel cross section and longitudinal slope.
- Accurate level measurements based on a fixed point.
- Measurements of velocity and flows at several points throughout the rating curve, including low flow, mid flow, and peak flow conditions.

To measure instantaneous flows during low flow and base flow conditions, two velocity measurement instruments are typically used—a Marsh-McBirney Model 2000 Portable Flowmeter connected by a cable to an electromagnetic open channel velocity sensor and the SonTek (YSI) FlowTracker Acoustic Doppler Velocimeter. The FlowTracker is a high-precision, shallow-water flowmeter that measures velocity in three dimensions and features an automatic discharge computation.

To make an instantaneous flow measurement, a tape measure is stretched across the stream, perpendicular to flow and secured on both banks of the stream. The tape is positioned so that it is suspended approximately 1 ft above the surface of the water. The distance on the tape directly above the waterline (i.e., where the water meets the bank) is recorded as the initial point. The first measurement is made at the first point where there is adequate water depth (i.e., at least 0.2 ft) and measurable velocity. At this point, three measurements are made, including water depth, velocity, and distance from the bank (the initial point). Subsequent depth, velocity, and distance measurements are made incrementally across the entire width of the channel. Data from the field measurements are entered into a computer model that calculates the stream’s cross-sectional profile from the depth and distance from bank measurements. Total flow across the channel is determined by integrating the velocity measurements over the cross-sectional surface area of the stream channel. The result is an instantaneous flow measurement in cubic feet per second.

A StreamPro Acoustic Doppler Current Profiler (ADCP) is used to measure mid- and high-stage flow conditions. The StreamPro ADCP is the USGS instrument of choice for measuring flows nationwide (Oberg et al., 2005). The instrument is pulled across the stream either by walking across a bridge or attaching the unit to a tagline. Data are collected in real time and transmitted by a wireless data link to a PC. Data can be viewed in real time and are typically post-processed following the field event in the office.

Rating curves are extended to high stream stages not measured using site-specific survey information and the Chézy–Manning formula (Linsley et al., 1982). The Chézy–Manning formula is an empirical formula for open channel flow, or flow driven by gravity, as follows:

$$Q = (1.486/n)AR^{2/3}S^{1/2}$$

where:

Q = flow
n = Manning Roughness coefficient
A = cross-sectional area
R = hydraulic radius
S = hydraulic slope

The hydraulic radius is derived as follows:

$$R = A/P$$

where:

A = cross-sectional area of flow (ft^2)
P = wetted perimeter (ft)

The Chézy–Manning formula was developed for conditions of uniform flow in which the water surface profile and energy gradient are parallel to the streambed and the area, hydraulic radius, and depth remain constant throughout the reach. Field surveys of the channel geometry of each MLS will be conducted to compute the channel characteristics for each station.

2.2.1.2 Channel Surveys

Channel surveys will be conducted at each station to gather basic hydraulic measurements of the receiving water channels and to derive stream discharge using the Chézy–Manning formula. Channel surveys will be conducted using a DeWalt self-leveling rotary laser. The cross-section survey involves placing endpoints at the highest point of the channel on each bank. A measuring tape is stretched between the endpoints such that the zero end of the tape is attached to the endpoint on the left bank of the channel (looking downstream). Channel depth is measured across the channel from a stadia rod that is vertical and level from the channel bottom. The channel thalweg surveys are conducted for the reach upstream and downstream of the cross-section. The average channel slope is calculated from the survey data.

Channel survey data are used with the Chézy–Manning formula to produce a rating curve for each sampling station. Each rating curve is calibrated using instantaneous flow measurements by adjusting the formula roughness coefficient.

2.2.1.3 United States Geological Survey Watersheds

MLS and TWAS are co-located or within relative proximity to USGS flow monitoring stations where possible. The flow data at stations co-located with USGS stream gauging stations will be compared to USGS data. USGS flow monitoring gauges are located in the larger watersheds, specifically Santa Margarita, San Luis Rey, Los Peñasquitos Creek, San Diego River, and Tijuana River. The USGS gauging stations are used to estimate the annual flow volumes for the watersheds. Data from the USGS gauging stations will also be used to validate flow monitoring data collected at the MLS locations that use standard flow rating techniques in all watersheds.

2.2.2 Water Quality Sampling

This section discusses the sampling procedures and analytical methods for water quality sampling. All sampling and analyses conducted for MLS or TWAS will be in accordance with applicable United States Environmental Protection Agency (USEPA) regulations and guidance.

2.2.2.1 Dry Weather

The 2013-2014 monitoring season will include monitoring in the southern WMAs (Mission Bay WMA to Tijuana River WMA), and the 2014-2015 monitoring season will include monitoring in the northern WMAs (Santa Margarita River to Los Peñasquitos, including Chollas Creek). Each long-term monitoring station will be monitored during three dry weather events—once during September prior to the start of the wet weather season, once during the wet weather season, and once in May or June after the end of the wet weather season. The transitional receiving water monitoring stations will be monitored during two dry weather events —once in September and once in May or June.

In the event that dry weather flow is not observed at a station during the September monitoring event prior to the start of the wet weather season, the first dry weather sampling event will occur during non-storm events (e.g., more than 72 hours after a storm event) if dry weather flow is observed during the wet weather season.

2.2.2.2 Wet Weather

The 2013-2014 monitoring season will include monitoring in the southern WMAs (Mission Bay WMA to Tijuana River WMA), and the 2014-2015 monitoring season will include monitoring in the northern WMAs (Santa Margarita River to Los Peñasquitos, including Chollas Creek). Each long-term station will be monitored during three wet weather events—during the first viable rainfall event of the wet weather season on or after October 1, during one event at least 30 days after the first rainfall event, and during one rainfall event after February 1. The transitional receiving water monitoring stations will be monitored during two wet weather events—once during the first viable rainfall event of the wet weather season on or after October 1 and once after February 1.

Storm events will be considered viable for mobilization if they are predicted to produce at least 0.10 inch of rainfall in the drainage area with at least a 70% chance of rainfall. Each storm of at least 0.1 inch of rainfall must be separated by a minimum of 72 hours, and the forecasted storm volume within $\pm$ 50% of the average storm volume and duration for the region. These mobilization criteria must be met at least 24 hours prior to the anticipated onset of rainfall. For the purposes of these criteria, storm forecasts will be obtained from the National Weather Service website (http://www.wrh.noaa.gov/sgx/).

For each monitoring event, a narrative description of the station, which includes the location, date, and duration of the storm event(s) sampled; rainfall estimates of the storm event; and the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event, will be recorded.

2.2.2.3 Grab Samples

Grab samples will be collected for those constituents that are not amenable to composite sampling. The constituents listed below are collected as grab samples in accordance with the methods provided in Appendix A:

- Temperature
- Hydrogen ion concentration (pH)
- Specific conductance
- Dissolved oxygen
- Turbidity
- Oil and grease
- Biochemical oxygen demand (BOD)
- Total coliform
- Fecal coliform
- Enterococcus

Samples will be collected from the horizontal and vertical center of the channel if possible and kept clear from uncharacteristic floating debris. Because oil and grease and other petroleum hydrocarbons tend to float, oil and grease grab samples will be collected at the air–water interface.

Microbiology samples will be collected using sterile techniques. Nitrile or latex type gloves will be worn during sample handling. During the sample event, a 100-milliliter (mL) sterile bacteria bottle will be used to collect the sample directly from the receiving water. Care will be employed to not allow contact with area structures or the bottom sediments. The container will be opened only for the needed time to collect the sample and will be closed immediately following sample collection. If it is suspected that the container was compromised at any time, the sample container will be discarded, and a new sample will be collected with a new sample bottle. The sample must be filled only to the 100-mL mark on the sample bottle (no over topped or under filled).

Field measurements will be performed for pH, specific conductance, temperature, dissolved oxygen, and turbidity using an YSI 6600 series water quality probe or similar device. Calibration of the instruments will be conducted prior to each sampling event according to the manufacturer’s specifications and calibrated following each sampling event. Calibration records will be kept on file.

A field observation data sheet will be completed for each sample collected to be representative of station conditions. Field observations include trash assessments, which will be performed at each station in accordance with the *Monitoring Workplan for the Assessment of Trash in San Diego County* (SDCRC, 2007a).

2.2.2.4 Composite Samples

A single flow-weighted composite sample will be collected at each station during the dry weather and wet weather monitoring events. During the monitoring event, sample aliquots will be collected in proportion to the rate of flow (i.e., flow-weighted) using automated equipment and Teflon-lined tubing. Dry weather flow-weighted composite samples will be collected over a typical 24-hour period, with a minimum of three sample aliquots collected per hour. Wet weather 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 stormwater 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. Some variation may occur depending on actual storm intensity and duration.

Flow-weighted water samples will be collected in pre-cleaned 20-liter (L) borosilicate graduated glass bottles. Sample bottles will be properly labeled with sample ID, date, and time; sealed with a pre-cleaned rubber stopper; and preserved on ice for transport to WESTON for sample compositing. Approximately 19 L of sample water will be contained in a "full" bottle. If flow rate sampling adjustments are made during a sampling event, the volume of sample to be used in sample compositing will differ among the various bottles from a given station to ensure the final composite sample is properly flow-weighted. To ensure a representative sample is used, samples should be agitated and mixed prior to pouring out any liquid. A 1000-mL glass graduated cylinder will be used to measure any sample volume that will be composited if it is less than the full amount contained within a 19-L sample bottle. The mixing will be done between transfers of liquid. Samples will be agitated continuously using a pre-cleaned glass stir bar as they are poured into the large pre-cleaned Nalgene containers. After all of the samples from a specific station have been added to the compositing container, subsampling may begin. Subsamples for chemical analyses will be poured into glass containers with Teflon® lids.

The flow-weighted composite samples will be analyzed for all the constituents not identified for grab sampling. The complete list of constituents for each watershed management area for dry weather and wet weather is provided in Appendix A.

2.2.3 Sample Analysis

Samples will be analyzed for the bacteria, chemistry, toxicity, and general field parameters provided in Appendix A. Appendix A includes the methods, volumes required, holding times, and target reporting limits for each constituent. Chemical, toxicity, and bacterial analysis of samples will be performed by a laboratory certified for the appropriate fields of testing by the California Environmental Laboratory Accreditation Program (ELAP). The laboratory(s) will also be a participant in the SMC Intercalibration Program.

General physical and chemical constituents will be analyzed by accredited laboratories, with the exception of field-measured constituents (i.e., pH, specific conductance, temperature, turbidity, and dissolved oxygen). Field measurements will be taken by WESTON's field scientists during sampling activities using an YSI 6600 series water quality probe or similar type device.

2.2.4 Quality Assurance/Quality Control

Quality assurance (QA) and quality control (QC) for sampling processes will include proper collection of the samples to minimize the possibility of contamination. All samples will be collected in laboratory-supplied, laboratory-certified, contaminant-free sample bottles. Field staff will wear powder-free nitrile or similar gloves at all times during sample collection.

QC samples will be taken to ensure that valid data are collected. Depending on the parameter, QC samples will consist of blanks and duplicate samples to remain compliant with Surface Water Ambient Monitoring Program (SWAMP) protocols. QC requirements will be reviewed and discussed with the appropriate staff to verify the proper working order of equipment, to refresh monitoring personnel in monitoring techniques, and to determine whether the data quality objectives are being met.

The QA objectives for analyses conducted by the participating analytical laboratories are detailed in their Laboratory QA Manuals. The objectives for accuracy and precision involve all aspects of the testing process, including the following:

- Methods and standard operating procedures (SOPs).
- Calibration methods and frequency.
- Data analysis, validation, and reporting.
- Internal QC.
- Preventive maintenance.
- Procedures to ensure data accuracy and completeness.

The results of the laboratory QC analyses will be reported with the final data. Any QC samples that fail to meet the specified QC criteria in the methodology will be identified, and the corresponding data will be appropriately qualified in the final report. All QA/QC records for the various testing programs will be kept on file for review by regulatory agency personnel.

2.2.4.1 Training and Certification

All field personnel will have current and relevant experience in all aspects of standard field monitoring, including use of relevant field equipment such as field instruments and monitoring equipment. Field personnel will be trained and have experience in the collection, handling/storage, and chain-of-custody procedures. Proper field sampling and sample-handling techniques will be reviewed prior to sampling, and only those staff with proficiency will be permitted to conduct the field work. Training will be documented in the health and safety plan of each member of the field team.

All personnel are responsible for complying with the QA/QC requirements that pertain to their organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function and a general knowledge of laboratory operations, test methods, QA/QC procedures, and records management.

2.2.4.2 Sample Handling and Processing

In accordance with USEPA sampling protocols and this work plan, all samples collected will be stored in the appropriate container type along with appropriate preservative (if required) for the analytical method(s) being performed. All samples will be collected in laboratory-supplied, laboratory-certified, contaminant-free sample bottles. Additionally, the samples will be stored chilled in ice chests for transfer to the analytical laboratories and for transport between laboratories. Chain of custody (COC) forms will be completed for each sample and will accompany the samples to the laboratories and between laboratories at all times.

The volume requirements and holding time requirements for each analytical measurement (Appendix A) are based on the recommendations in the *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association (APHA), 2005) and in the USEPA methods. The stormwater samples will be transported from the field to the laboratory under WESTON COC procedures. Samples moved between laboratories will be transported under those laboratories' COC procedures. Samples not processed at WESTON's laboratories will be submitted by WESTON to the appropriate laboratories.

2.2.4.3 Chain of Custody Procedures

Samples will be considered to be in custody if they are (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a container and secured with an official seal such that the sample could not be reached without breaking the seal. The principal documents used to identify samples and to document possession will be COC records, field logbooks, and field tracking forms. COC procedures will be used for samples throughout the collection, transport, and analytical process.

COC procedures will be initiated during sample collection. A COC record will be provided with each sample or group of samples. Each person who will have custody of the samples will sign the form and ensure the samples will not be left unattended unless properly secured. Documentation of sample handling and custody includes the following:

- Sample identifier.
- Sample collection date and time.
- Any special notations on sample characteristics or analysis.
- Initials of the person collecting the sample.
- Date the sample was sent to the analytical laboratory.
- Shipping company and waybill information.

Completed COC forms will be placed in a plastic envelope and kept inside the cooler containing the samples. Once delivered to the analytical laboratory, the COC form will be signed by the person receiving the samples. The condition of the samples will be noted and recorded by the receiver. COC records will be included in the final reports prepared by the analytical laboratories and are considered an integral part of the report.

2.2.4.4 Field Quality Control

For all conventional water quality analyses except field measurements performed on grab samples, field blanks and field duplicates will be analyzed in accordance with SWAMP guidelines.

For toxicity testing, only field duplicates will be collected. The use of controls and reference toxicant testing are QA/QC measures that have been put in place to identify changes in test organism sensitivity due to stress or other factors.

2.2.4.5 Equipment Calibration

All instruments used for field and laboratory analyses will be calibrated in accordance with manufacturer's specifications. Calibration of the flow monitoring and sampling equipment will be conducted immediately prior to deployment or use and will be field verified during each data download or sample event. The calibrations will be conducted in accordance with the manufacturer's specifications.

Field measurements for pH, specific conductance, dissolved oxygen, turbidity, and temperature will be made using an YSI 6600 series water quality probe or similar probe according to the manufacturer's specifications. The YSI 6600 series water quality probe will be calibrated with calibration solutions, and it will be verified that the expiration date has not been exceeded.

2.2.4.6 Equipment Decontamination and Cleaning

QA/QC for sampling processes begins with proper collection of the samples to minimize the possibility of contamination. All water samples will be collected in laboratory-certified, contaminant-free bottles. Appropriate sample containers and field measurement and sampling gear will be transported to the sample location in clean storage containers. Field measurements will be taken and recorded using the appropriate decontaminated equipment. If sampling poles are used for collecting water samples, they will be decontaminated between sampling locations.

2.3 Post-Storm Sediment Pyrethroid Monitoring

Synthetic pyrethroid monitoring will be conducted in compliance with Section II.A.7 of the 2007 Permit and in accordance with the *Monitoring Workplan for the Assessment of Synthetic Pyrethroids in San Diego County* (SDCRC, 2007b). The pyrethroid monitoring program focuses on sediment and water column assessments to evaluate the presence and potential effects of pyrethroids in urban waterways within the San Diego region. Post-storm sediment samples will be collected from the MLS and TWAS locations within 2 weeks following the first-flush rainfall event of the wet weather season.

2.4 Toxicity Identification Evaluations

Toxicity identification evaluations (TIEs) will be conducted in compliance with Section II.A.4 of the 2007 Permit and used to determine the causative agent(s) of toxicity. The Copermittees have budgeted for three Phase I TIEs in the event significant and persistent toxicity is observed (as defined by the 2007 Permit) at an MLS or TWAS location during more than one event for the same species during the monitoring season. TIEs will be conducted according to the guidelines for characterizing chronically toxic effluents (USEPA, 1991; USEPA, 1992; USEPA, 1993a; USEPA, 1993b).

Phase I TIE testing involves manipulating the sample(s) by the methods presented in Table 2-3.

Treatment blanks will be created for each TIE treatment to determine the effects of the manipulation on laboratory dilution water. The results of these blanks will be used to determine whether any changes in toxicity of the control (dilution water) are impacted by the chemical or physical manipulation of the sample. A baseline test, run concurrently with the TIE treatments, will be performed to assess the toxicity of the unmanipulated sample(s). Baseline tests are intended to confirm the presence of toxicity in the sample and to benchmark the toxicity for comparison to toxicity in TIE treatments.

Table 2-3. Phase I TIE Manipulations

Physical and Chemical Manipulations (Tests) on Water Samples	Purpose of Test
Filtration	Detects filterable compounds (e.g., total suspended solids (TSS) related)
Aeration	Detects volatile, oxidizable, sublatable, or spargeable compounds
Ethylenediaminetetraacetic acid (EDTA) addition	Detects cationic metals (e.g., cadmium)
Sodium thiosulfate (STS) addition	Detects oxidative compounds (e.g., chlorine)
Solid phase extraction (SPE) over C_{18} column, followed by methanol elution	Detects non-polar organics and some surfactants
Piperonyl butoxide (PBO) addition	Detects organophosphate pesticides and pyrethroids
Carboxyl esterase addition	Detects pyrethroids
Bovine serum albumin (BSA) addition	Protein BSA is used as a control for the carboxyl esterase
Temperature reduction	Increases toxicity of pyrethroid pesticides
pH reduction	Detects pH-dependent toxicants (e.g., ammonia or sulfides)

2.5 Dry Weather Receiving Water Bioassessment Monitoring

Dry weather receiving water bioassessment monitoring will be conducted in accordance with the 2013 Permit (D.1.a.(1), D.1.a.(3)(a), D.1.c.(5), and D.1.e.(1)(a)). Dry weather receiving water bioassessment monitoring will include the following monitoring activities: bioassessment at the transitional receiving water monitoring locations in accordance with the 2013 Permit (D.1.a.(1)), bioassessment at each long-term receiving water monitoring location, and participation in the SMC Regional Monitoring Program. Bioassessment surveys will be conducted during the spring/summer dry season bioassessment index period, typically from May through July. Benthic macroinvertebrates (BMIs) and physical habitat data will be collected following the *SWAMP Bioassessment Procedures: Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode, 2007) using the reach-wide benthos method. Benthic algae (i.e., periphyton) monitoring will be conducted in accordance with the SWAMP *Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California* (Fetscher et al., 2009). Samples will be collected and processed for ash-free dry mass (AFDM), chlorophyll-a analysis, and periphyton taxonomy. Reach-wide algal cover will be quantified as part of the SWAMP physical habitat assessment. Physical habitat quality of the monitoring stations will be quantified using the California Rapid Assessment Method (CRAM) for riverine wetlands (Collins et al., 2012).

The SWAMP sampling protocol includes the collection of stream BMI and also assesses the physical quality and condition of the streambed and banks in detail. (Note: A physical habitat index based on the SWAMP procedure has not been developed at the time of this report). CRAM assessments incorporate broader buffer zone and land use attributes than SWAMP, and also provide a numerical quality score for each station. BMIs reside in streams for periods ranging from a month to several years, and have varying sensitivities to the multiple stressors associated with urban runoff. Using species specific tolerance values and community species composition, numerical biometric indices are calculated, allowing for comparison of relative habitat health among streams in a region. By assessing the invertebrate community structure of a stream, a cumulative measure of stream habitat health and ecological response is obtained.

The data include a taxonomic listing of all BMIs identified in the surveys, and calculation of the biological metrics listed in the California Stream Bioassessment Procedure (CSBP). Additionally, calculation of two indices that rate the overall BMI community quality will be performed. These include the Index of Biotic Integrity (IBI) (Ode et al., 2005) and the observed to expected (O/E) ratio of taxa (Hawkins, Western Center for Monitoring and Assessment, 2010).

2.5.1 2014 SMC Regional Monitoring Program

Participation in the SMC Regional Monitoring Program will be conducted following the protocols developed by the SMC Bioassessment Technical Workgroup. The probabilistic survey design implemented from 2009 through 2013 following the methods included in the *Regional Monitoring of Southern California's Coastal Watersheds Workplan* (Southern California Coastal Water Research Project (SCCWRP), 2007) will be suspended in 2014. The 2014 SMC Regional Monitoring Program will include two special studies and will be conducted in accordance with the interim *Regional Watershed Monitoring Program – Proposal for 2014 Sampling* (SCCWRP, 2013) and the *Southern California Regional Watershed Monitoring Program, Bioassessment Quality Assurance Project Plan* (SCCWRP, 2009). The two special studies will include a nonperennial stream study with the goal of validating and refining the assessment tools for use in nonperennial streams, and a trend site study with the goal of detecting change in condition over time at probabilistic stations.

The nonperennial stream study will focus on locations in a reference condition; i.e., streams that flow through the wet season and dry out during the bioassessment index period. Ideally, multiple visits will be made through the drying period to quantify how the BMI and algae communities change through this period. Because of the unpredictability of the pace of stream drying, sampling will begin earlier than the usual bioassessment index period, preferably in early April. Site selection will be at the discretion of the monitoring agencies with collaboration with and confirmation by the SMC Program Manager at SCCWRP. Toxicity testing will not be performed at the nonperennial stations, and samples will be analyzed for a limited number of chemicals.

The trend site study will focus on resampling probabilistic stations that were sampled early in the SMC Regional Monitoring Program. Site selection will emphasize capturing a range of conditions; however, channels that are fully concrete lined will be excluded from the study. Stations will be revisited, and samples will be analyzed for the full set of analytes used during the first 5 years of the SMC Regional Monitoring Program.

2.5.2 2015 SMC Regional Monitoring Program

At this time, the 2015 SMC Regional Monitoring Program is still being developed. The SMC Bioassessment Technical Workgroup is working to determine which components of the 2009-2013 SMC Regional Monitoring Program were effective tools for achieving the program's goals and what monitoring elements may be suspended or added moving forward.

2.5.3 Monitoring Reaches

The dry weather bioassessment receiving water monitoring reaches are located at the transitional MLS and TWAS monitoring stations (Table 2-1 and Table 2-2), long-term receiving water monitoring locations (Table 2-1 and Table 2-2), reference stations for the bioassessment receiving water monitoring (Table 2-4), and SMC 2014 Research Plan monitoring locations (Table 2-5). For the SMC Regional Monitoring Program, the original station locations were selected in a stratified random approach by the SMC Program Manager at SCCWRP.

Table 2-4. Reference Stations for 2014 Receiving Water Bioassessment Monitoring

Stream	Reference Station Identifier	Latitude	Longitude
Cottonwood Creek	REF-CWC	32.66102	-117.03916
Kitchen Creek	REF-KC2	32.87181	-116.61358
Boulder Creek	REF-BC	32.96672	-116.653777

Table 2-5. SMC Regional Monitoring Program Monitoring Locations for 2014

SMC Region	Stream	Station Identifier	Latitude	Longitude
Nonperennial Locations				
Northern San Diego	French Creek	903FRC	33.35652	-116.91283
Central San Diego	Black Canyon Creek	905BCC	33.13086	-116.79575
Mission Bay San Diego	Unnamed Tributary to Boulder Creek	907BCT	32.96654	-116.65211
Southern San Diego	La Posta Creek	911LAP	32.70021	-116.48152
Trend Locations				
Northern San Diego	Key's Creek	SMC01909	33.31129	-117.13885
Northern San Diego	Santa Margarita	SMC04661	33.23370	-117.09392
Central San Diego	Buena Creek	SMC01049	33.17601	-117.20488
Central San Diego	Los Peñasquitos Creek	SMC00198	32.93710	-117.13851
Mission Bay San Diego	Murphy Canyon Creek	SMC01990	32.79654	-117.11327

Table 2-5. SMC Regional Monitoring Program Monitoring Locations for 2014

SMC Region	Stream	Station Identifier	Latitude	Longitude
Mission Bay San Diego	San Diego River	SMC08150	32.88438	-116.82289
Southern San Diego	Sweetwater River	SMC01962	32.66102	-117.03916
Southern San Diego	Tijuana River	SMC03510	32.87181	-116.61358

Historically, reference stations have been designated by the California Department of Fish and Game (CDFG) and the RWQCB based on upstream land use characteristics as determined by geographic information system (GIS) data sets. When selecting reference monitoring stations for comparison with urban affected stations, elevation is considered. Most of the reference stations are at elevations similar to the urban locations. The reference stations are often located in the upper erosional portion of the hydrologic units, whereas the test monitoring stations are generally in lower depositional areas. This difference may affect benthic community composition independent of water quality.

Comparison of urban monitoring stations to reference stations will not be limited to the reference stations sampled in this program. The benthic community summary indices that provide community quality ratings already incorporate a broad range of historical reference stations throughout the region. For example, Ode et al. (2005) used 275 different reference stations to develop the IBI, and the scoring criteria were based on mean metric values for all of these stations. Reference stations monitored concurrently with the urban stations provide a direct temporal correlation that includes seasonal environmental variables (e.g., rainfall).

2.5.4 Monitoring Reach Delineation

Using SWAMP methodology, every monitoring reach is 150 meters (m) in length and will be sampled from downstream to upstream. If a portion of a reach is inaccessible, the reach length may be reduced to as little as 100 m. The MLS and TWAS bioassessment reaches are placed as closely as possible to the water quality and flow monitoring locations.

2.5.5 Macroinvertebrate Sample Collection

BMI samples will be collected at evenly spaced 15-m transects for a total of 11 transects in the 150-m reach. The samples will be collected in an alternating margin-center-margin pattern. Collections will be made using a 1-ft-wide, 0.5-millimeter (mm)-mesh, D-frame kick-net. A 1-ft^2 area upstream of the net will be sampled by disrupting the substrate and scrubbing the cobble and boulders, so that the organisms will be dislodged and swept into the net by the current. The duration of the sampling generally ranges from 1 to 3 minutes, depending on the substrate complexity. Every monitoring station will be sampled from downstream to upstream. The samples will be combined into a single composite sample for the reach, transferred to 1-quart jars, preserved with 95% ethanol, and returned to WESTON's laboratory for processing. Photographs will be taken of every monitoring station.

2.5.6 Multihabitat Periphyton Sample Collection

Periphyton (benthic algae) will be collected using the reach-wide procedure and within the same transects used for BMI collection, but offset 1 m upstream to avoid disturbed substrate. Depending on the substrate type and the stream habitat, one of three sampling devices will be used to collect the substrate sample—a 12.6 square centimeter (cm^2) rubber delimiter, a 4-cm diameter polyvinyl chloride (PVC) delimiter, or a syringe scrubber. After all transects are sampled, the subsamples will be composited. The macroalgae will be gathered and separated from the composited liquid. A subsample of the macroalgae will be taken for the soft-bodied taxonomic identification sample. The composite liquid volume will be recorded, and the remaining macroalgae will be finely cut up and thoroughly mixed with the composite liquid. The homogenized sample will be used for the diatom taxonomic identification sample, as well as the two filtered biomass samples. The diatom and soft-bodied algae samples will be fixed accordingly before being delivered to the laboratory for taxonomic identification. Taxonomic identification will be performed by a qualified taxonomist. The remaining homogenized portion of the composite will be filtered in the field, and the filters will be placed on ice and/or frozen until delivery to the chemistry laboratory for chlorophyll-a and ash-free dry mass analysis. A separate soft-bodied algae sample will be taken for qualitative taxonomic identification. The qualitative sample consists of a composite of all soft-bodied algae found within the reach. The sample will be left unpreserved and put on ice or refrigerated until delivery to the laboratory for taxonomic identification. Qualitative taxonomic identifications will be performed by a qualified taxonomist for the receiving water and SMC monitoring stations.

2.5.7 Physical Habitat Quality Assessment

For each monitoring reach sampled, the physical habitat of the stream and its adjacent banks will be assessed to provide a record of the overall physical condition of the reach. Parameters such as substrate complexity, channel alteration and human influence, frequency of riffles, and width and quality of riparian zones will provide a more comprehensive understanding of the condition of the stream. Additionally, specific characteristics of the sampled riffles will be measured, including substrate size classes, stream depth, gradient, sinuosity, and flow volume.

CRAM assessments of each monitoring station also will be performed. This method assesses the quality of the in-stream habitat features as well as the buffer zones (250 m perpendicular to flow from each bank and 500 m upstream and downstream of the monitoring reach), hydrologic source quality, and biotic structure quality. A final CRAM score will be calculated that can range from 25 to 100 points, with the higher scores indicating higher quality conditions.

Water quality measurements will be taken at each of the monitoring stations using a YSI Model 6600 (or comparable) data sonde. Measurements will include water temperature, specific conductance, pH, and dissolved oxygen. Samples will be collected for laboratory analysis following the protocols outlined in the SMC Regional Monitoring Program Workplan. Stream flow velocity will be measured with a Marsh-McBirney Model 2000 (or comparable) portable flowmeter, or will be visually estimated when the water is too shallow for the flowmeter.

2.5.8 Laboratory Processing and Analysis

Laboratory processing of BMI samples will follow the SWAMP Bioassessment Procedures: *Standard Operating Procedures for Laboratory Processing and Identification of Benthic Macroinvertebrates in California* (Woodward et al., 2012). At the laboratory, samples are poured over a No. 35 standard testing sieve (0.5-mm stainless-steel mesh), and the ethanol is retained for reuse. The sample is gently rinsed with fresh water, and large debris such as wood, leaves, or rocks are removed. The sample is transferred to a tray marked with grids approximately 50 cm^2 in size. One grid is randomly selected, and the sample material contained within that grid is removed and processed. In cases where the test organisms appear extremely abundant, a fraction of the grid may be removed.

The material from the grid is examined under a stereomicroscope; and all the invertebrates are removed, sorted into major taxonomic groups, and placed in vials containing 70% ethanol. If there are less than 600 test organisms in the grid, another grid is selected and processed. This process is repeated until 600 organisms are removed from the sample, or until the entire sample is sorted. Organisms from a grid in excess of 600 are also removed, counted, and recorded as "remaining test organisms," so that estimated total organism abundance and density for the sample can be calculated. Terrestrial organisms, vertebrates, water-column associated organisms (e.g., copepods), and nematodes are not removed from the samples. Processed material from the sample is placed in a separate jar and labeled "sorted," and the unprocessed material is returned to the original sample container and archived. Sorted material is retained for QA purposes. All organisms are identified to Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) standard taxonomic effort Level II (SAFIT, 2006).

2.5.9 Quality Assurance / Quality Control

QA/QC procedures for the Bioassessment Monitoring and SMC Program will be consistent with those outlined in Section 2.2.4. In addition, QA of the benthic infauna sample sorting will be performed on all of the samples to ensure at least a 90% removal rate of organisms. Organisms removed during sorting QA also will be identified. Taxonomic QA will be performed on 10% of the samples.

2.6 Dry Weather Hydromodification Monitoring

This section describes the sampling and data collection methods for the dry weather receiving water hydromodification monitoring requirements as outlined in Provision D.1.c.(6) of the 2013 Permit as presented below:

(6) Dry Weather Receiving Water Hydromodification Monitoring
In addition to the hydromodification monitoring conducted as part of the Copermittees' Hydromodification Management Plans, hydromodification monitoring for each long-term receiving water monitoring station is required at least once during the term of this Order. The Copermittees must collect the following hydromodification monitoring observations and measurements within an appropriate domain of analysis during at least one dry weather monitoring event for each long-term receiving water monitoring station:

(a) Channel conditions, including:

(i) Channel dimensions,

(ii) Hydrologic and geomorphic conditions, and

(iii) Presence and condition of vegetation and habitat;

(b) Location of discharge points;

(c) Habitat integrity;

(d) Photo documentation of existing erosion and habitat impacts, with location (i.e. latitude and longitude coordinates) where photos were taken;

(e) Measurement or estimate of dimensions of any existing channel bed or bank eroded areas, including length, width, and depth of any incisions; and

(f) Known or suspected cause(s) of existing downstream erosion or habitat impact, including flow, soil, slope, and vegetation conditions, as well as upstream land uses and contributing new and existing development.

Dry weather hydromodification monitoring is required at each long-term receiving water monitoring station. The monitoring will coincide with the spring receiving water dry weather monitoring event in May or June and the dry weather receiving water bioassessment monitoring. The domain of analysis at each long-term monitoring station for dry weather hydromodification monitoring will be within the same reach of the channel as dry weather bioassessment monitoring.

Table 2-6 provides an outline of the hydromodification monitoring requirements and the methods for each assessment category. Detailed methods for each assessment category are described in the following sections.

Table 2-6. Hydromodification Monitoring Requirements

Assessment Requirement Category		Method
(a)	Channel conditions, including:	
(a)(i)	Channel dimensions,	Channel survey (cross-sectional and thalweg survey)
(a)(ii)	Hydrologic and geomorphic conditions	SCCWRP channel assessment tool
(a)(iii)	Presence and condition of vegetation and habitat	CRAM
(b)	Location of discharge points	Table of municipal separate storm sewer system (MS4) outfalls to stream segment
(c)	Habitat integrity	CRAM
(d)	Photo documentation of existing erosion and habitat impacts, with location (i.e., latitude and longitude coordinates) where photos were taken	Channel survey and photo documentation
(e)	Measurement or estimate of dimensions of any bed or bank eroded areas, including length, width, and depth of any incisions	Channel survey
(f)	Known or suspected cause(s) of existing downstream erosion or habitat impact, including flow, soil, slope, and vegetation conditions, as well as upstream land uses and contributing new and existing development	GIS desktop analysis and SCCWRP channel assessment tool

2.6.1 Channel Dimensions

Channel surveys will be conducted at each station to gather basic hydraulic measurements of the receiving water channels. Channel surveys will be conducted using a DeWalt self-leveling rotary laser. The cross-section survey involves placing endpoints at the highest point of the channel on each bank. A measuring tape will be stretched between the endpoints such that the zero end of the tape is attached to the endpoint on the left bank of the channel (looking downstream). Channel depth will be measured across the channel from a stadia rod that is vertical and level from the channel bottom. The channel thalweg surveys will be conducted for the reach upstream and downstream of the cross-section. The average channel slope will be calculated from the survey data.

2.6.2 Hydrologic and Geomorphic Conditions

The geomorphic assessment will be conducted to characterize the susceptibility of the channel and gather basic hydraulic measurements of the receiving water channels. The geomorphic assessment is comprised of the channel survey and the SCCWRP channel assessment tool. The SCCWRP Field Manual (Bledsoe et al., 2010) will be used to assess the vertical and lateral susceptibility of the receiving water channels. The domain of analysis for each monitoring station is derived from the desk and field components of the screening tool and will be within reach of the channel used for dry weather bioassessment monitoring. A suite of field measurements will also be made to characterize the channel bed and banks, and overall stability state. Sediment samples will be collected to characterize bed materials. Fixed-interval pebble counts will be performed for each reach where the channel bed is comprised of gravel or coarser material (Bunte and Abt, 2001), and channel beds comprised of fine material will be noted as sand or cohesive materials (bed gradations are not required for channels with D50 < 2 mm).

2.6.3 Presence and Condition of Vegetation and Habitat Integrity

The presence and condition of vegetation and habitat integrity will be determined from the data collected during dry weather bioassessment monitoring. For dry weather bioassessment monitoring, the sampling will follow the protocols previously outlined in Section 2.5. Physical habitat quality assessments of the monitoring stations using CRAM provide a numerical summary score of the physical conditions for each station. This method involves assessing the quality of the in-stream habitat features as well as the buffer zones (250 m perpendicular to flow from each bank and 500 m upstream and downstream of the monitoring reach), hydrologic source quality, and biotic structure quality. For each monitoring reach sampled, the physical habitat of the stream and its adjacent banks will be assessed to provide a record of the overall physical condition of the reach. Parameters such as substrate complexity, channel alteration and human influence, frequency of riffles, and width and quality of riparian zones will provide a more comprehensive understanding of the condition of the stream. Additionally, specific characteristics of the sampled riffles will be measured, including substrate size classes, stream depth, gradient, sinuosity, and flow volume. A final CRAM score will be calculated that can range from 25 to 100 points, with higher scores indicating higher quality conditions. CRAM ratings of good, fair, and poor are defined by the score (i.e., for the CRAM score range of 25-100, <50=low, 50-75=moderate, and >75=high).

2.6.4 Photo Documentation

A channel survey will be conducted and photographs will be used to document the conditions in the receiving water channels including any existing erosion and habitat impacts. Photographs will be taken using a digital camera with a built-in GPS, altimeter, and compass. Photo documentation will be conducted using the general procedures outlined in San Diego Water Board Stream Photo Documentation Procedures for 401 Water Quality Certifications Standard Operating Procedure.

The following information will be recorded for each photograph:

- Project name
- General location
- Photographer and team members
- Photo number
- Date
- Time

At a minimum, photographs will be taken of the following:

- Long view up or down the stream (from stream level) showing changes in the stream bank and vegetation

- Long view and medium view of streambed changes (e.g., thalweg, gravel, meanders)
- Long views from a bridge or other elevated position
- Medium and close views of structures and plantings
- Medium views of bars and banks, with a person (preferably holding a stadia rod) in view for scale
- Close views of streambed with a ruler or other common object in the view for scale

2.6.5 Dimensions of Bed or Bank Eroded Areas

Measurements or estimates of dimensions of any bed or bank eroded areas, including length, width, and depth of any incisions, will be conducted during the channel survey. Bed or bank eroded areas will be documented with photographs as described in the channel survey above.

2.6.6 Location of Discharge Points/Known or Suspected Causes of Erosion or Habitat Impact

Known or suspected cause(s) of existing downstream erosion or habitat impact, including flow, soil, slope, and vegetation conditions, as well as upstream land uses and contributing new and existing development, will be assessed during a GIS desktop exercise and the SCCWRP channel assessment tool.

3.0 ASSESSMENT AND REPORTING

The Transitional Monitoring and Assessment Annual Report, which will be submitted to the San Diego RWQCB on January 31, 2015, will include a description of the 2013-2014 transitional receiving water monitoring implemented during the 2013–2014 monitoring season. The Transitional Monitoring and Assessment Annual Report, which will be submitted to the San Diego RWQCB on January 31, 2016, will include a description of the 2014-2015 transitional receiving water monitoring implemented during the 2014–2015 monitoring season.

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APPENDIX A

List of Analytes, Methods, Volume Required, Holding Time, and Target Reporting Limit by Station for Dry Weather and Wet Weather

Constituent	Volume Required	Method	Target Reporting Limit	Units	Max Holding Time	MLS and TWAS Stations for Dry Weather in Accordance with San Diego RWQCB Order No. R9-2007-0001	Chollas Creek (CC-NF54) for Dry Weather in Accordance with San Diego RWQCB Order No. R9-2007-0001	Long-Term Receiving Water Monitoring Staions for Dry Weather by WMA in Accordance with San Diego RWQCB Order No. R9-2013-001								
								SMR	SLR	CAR	SDC	LPC	MB	SDR	SDB	TJR
pH	In field	Meter	0.01	pH	N/A	x	x	x	x	x	x	x	x	x	x	x
Temperature	In field	Meter	0.1	°C	N/A	x	x	x	x	x	x	x	x	x	x	x
Specific Conductance	In field	Meter	1	µS/cm	N/A	x	x	x	x	x	x	x	x	x	x	x
Dissolved Oxygen	In field	Meter	0.01	mg/L	N/A			x	x	x	x	x	x	x	x	x
Turbidity	In field	Meter	0.1	NTU	N/A	x	x	x	x	x	x	x	x	x	x	x
Total Dissolved Solids	500 mL	SM 2540C	10	mg/L	7D	x	x	x	x	x	x	x	x	x	x	x
Total Suspended Solids	1000 mL	SM 2540D	5.0	mg/L	7D	x	x	x	x	x	x	x	x	x	x	x
Total hardness	Calculated from Calcium and Magnesium	SM 2340B	0.662	mg/L	N/A	x	x	x	x	x	x	x	x	x	x	x
Total Organic Carbon	250 mL	SM 5310 C	0.30	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Dissolved Organic Carbon	250 mL	SM 5310C	0.50	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Chemical Oxygen Demand	250 mL	USEPA 410.4	5.0	mg/L	28D	x	x									
Sulfate	250 mL	USEPA 300.0	0.50	mg/L	28D			x	x	x	x	x	x	x	x	x
Chloride	250 mL	USEPA 300.0	0.50	mg/L	28D				x		x			x		
Methylene Blue Active Substances (MBAS)	500 mL	SM 5540C	0.050	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
Total Phosphorus	250 mL	USEPA 365.1	0.010	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Dissolved Phosphorus	250 mL	USEPA 365.1	0.010	mg/L	48H	x	x									
Orthophosphate	250 mL	USEPA 365.1	0.0020	mg/L	48H			x	x	x	x	x	x	x	x	x
Nitrate as N	250 mL	USEPA 353.2	0.10	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
Nitrite as N	250 mL	USEPA 353.2	0.10	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
TKN	250 mL	USEPA 351.2	0.10	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Ammonia as N	250 mL	USEPA 350.1	0.10	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
BOD, five-day	1,000 mL	SM 5210B	2.0	mg/L	48H	x	x									
Oil and grease	1,000 mL	USEPA 1664A	5.0	mg/L	28D	x	x									
Color	500 mL	SM 2120B	3.0	Color Units	48H						x			x	x	x
Organophosphate Pesticides	2 L	USEPA 625M	0.01	µg/L	7/40D[2]			x	x	x	x	x	x	x	x	x
Synthetic pyrethroids	2 L	GC/MS NCI-SIM	2-10	ng/L	7/40D[2]			x	x	x	x	x	x	x	x	x
Chlordane	2 L	USEPA 608	0.100	µg/L	7/40D[2]		x								x	
Malathion	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x									
Diazinon	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x								x	
Chlorpyrifos	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x	x								
Perchlorate	250 mL	USEPA 314	0.0020	mg/L	28D											x
PAHs (Polycyclic Aromatic Hydrocarbons)	2 L	USEPA 625M/ EPA 8270C SIM	0.10	µg/L	7/40D[2]		x								x	
PCBs (Polychlorinated Biphenols) Congeners	2 L	PCB Congener/ GC/MS/MS	0.010	µg/L	1Yr		x								x	
DDE (Dichlorodiphenyldichloroethylene)	2 L	USEPA 608	0.005	µg/L	7/40D[2]					x						
DDT (Dichlorodiphenyltrichloroethane)	2 L	USEPA 608	0.005	µg/L	7/40D[2]					x						
Pentachlorophenol (PCP)	2 L	USEPA 625M/ EPA 8270C	1.0	µg/L	7/40D[2]						x					
Aluminum (Al)	250 mL	USEPA 200.8	0.005	mg/L	6M						x				x	
Antimony (Sb)	250 mL	USEPA 200.8	0.0005	mg/L	6M	x	x									
Arsenic (As)	250 mL	USEPA 200.8	0.0004	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Cadmium (Cd)	250 mL	USEPA 200.8	0.0001	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Chromium (Cr)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Chromium III (Cr)	Calculated from Total Chromium and Chromium VI			mg/L	N/A			x	x	x	x	x	x	x	x	x
Chromium VI (Cr)	250 mL	USEPA 218.6	0.0003	mg/L	28D			x	x	x	x	x	x	x	x	x
Copper (Cu)	250 mL	USEPA 200.8	0.0005	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Iron (Fe)	250 mL	USEPA 200.7	0.010	mg/L	6M			x	x	x	x	x	x	x	x	x
Lead (Pb)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Manganese (Mn)	250 mL	USEPA 200.8	0.0002	mg/L	6M			x	x	x	x	x	x	x	x	x
Mercury (Hg)	250 mL	USEPA 245.1	0.00005	mg/L	28D			x	x	x	x	x	x	x	x	x
Nickel (Ni)	250 mL	USEPA 200.8	0.0008	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Selenium (Se)	250 mL	USEPA 200.8	0.0004	mg/L	6M			x	x	x	x	x	x	x	x	x
Silver (Ag)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Thallium (Tl)	250 mL	USEPA 200.8	0.0002	mg/L	6M			x	x	x	x	x	x	x	x	x
Zinc (Zn)	250 mL	USEPA 200.8	0.005	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Total coliforms	100 mL	SM 9221B	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Fecal coliforms	100 mL	SM 9221E	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Enterococci	100 mL	SM 9230B	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Acute Survival with *Hyalella azteca*	4L	EPA-821-R-02-012	N/A	Pass/Fail	36hr	x	x									
Larval Survival and Growth with *Pimephales promelas*	15L	EPA-821-R-02-013	N/A	Pass/Fail	36hr			x*	x*	x*	x*	x*	x*	x*	x*	x*
Survival and Reproduction with *Ceriodaphnia dubia*	4L	EPA-821-R-02-013	N/A	Pass/Fail	36hr	x	x	x*	x*	x*	x*	x*	x*	x*	x*	x*
Embryo-Larval Development with *Strongylocentrotus purpuratus*	4L	EPA-600-R-95-136	N/A	Pass/Fail	36hr			x*	x*	x*	x*	x*	x*	x*	x*	x*
Growth with *Selenastrum capricornutum*	4L	EPA-821-R-02-013	N/A	Pass/Fail	36hr	x	x	x*	x*	x*	x*	x*	x*	x*	x*	x*

[1] Nephelometric turbidity units.

[2] 7 days for sample extraction and 40 days holding for extract to be analyzed.

*If sample has salinity less than 1ppt, then tests include *Pimephales promelas,Ceriodaphnia dubia,Selenastrum capricornutum*. If sample has salinity greater than 1ppt, then tests include *Strongylocentrotus purpuratus.*

Constituent	Volume Required	Method	Target Reporting Limit	Units	Max Holding Time	MLS and TWAS Stations for Wet Weather in Accordance with San Diego RWQCB Order No. R9-2007-0001	Chollas Creek (CC-NF54) for Wet Weather in Accordance with San Diego RWQCB Order No. R9-2007-0001	Long-Term Receiving Water Monitoring Staions for Wet Weather by WMA in Accordance with San Diego RWQCB Order No. R9-2013-001								
								SMR	SLR	CAR	SDC	LPC	MB	SDR	SDB	TJR
pH	In field	Meter	0.01	pH	N/A	x	x	x	x	x	x	x	x	x	x	x
Temperature	In field	Meter	0.1	°C	N/A	x	x	x	x	x	x	x	x	x	x	x
Specific Conductance	In field	Meter	1	µS/cm	N/A	x	x	x	x	x	x	x	x	x	x	x
Dissolved Oxygen	In field	Meter	0.01	mg/L	N/A			x	x	x	x	x	x	x	x	x
Turbidity	In field	Meter	0.1	NTU	N/A	x	x	x	x	x	x	x	x	x	x	x
Total Dissolved Solids	500 mL	SM 2540C	10	mg/L	7D	x	x	x	x	x	x	x	x	x	x	x
Total Suspended Solids	1000 mL	SM 2540D	5.0	mg/L	7D	x	x	x	x	x	x	x	x	x	x	x
Total hardness	Calculated from Calcium and Magnesium	SM 2340B	0.662	mg/L	N/A	x	x	x	x	x	x	x	x	x	x	x
Total Organic Carbon	250 mL	SM 5310 C	0.30	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Dissolved Organic Carbon	250 mL	SM 5310C	0.50	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Chemical Oxygen Demand	250 mL	USEPA 410.4	5.0	mg/L	28D	x	x									
Sulfate	250 mL	USEPA 300.0	0.50	mg/L	28D			x	x	x	x	x	x	x	x	x
Chloride	250 mL	USEPA 300.0	0.50	mg/L	28D				x		x			x		
Methylene Blue Active Substances (MBAS)	500 mL	SM 5540C	0.050	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
Total Phosphorus	250 mL	USEPA 365.1	0.010	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Dissolved Phosphorus	250 mL	USEPA 365.1	0.010	mg/L	48H	x	x									
Orthophosphate	250 mL	USEPA 365.1	0.0020	mg/L	48H			x	x	x	x	x	x	x	x	x
Nitrate as N	250 mL	USEPA 353.2	0.10	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
Nitrite as N	250 mL	USEPA 353.2	0.10	mg/L	48H	x	x	x	x	x	x	x	x	x	x	x
TKN	250 mL	USEPA 351.2	0.10	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
Ammonia as N	250 mL	USEPA 350.1	0.10	mg/L	28D	x	x	x	x	x	x	x	x	x	x	x
BOD, five-day	1,000 mL	SM 5210B	2.0	mg/L	48H	x	x									
Oil and grease	1,000 mL	USEPA 1664A	5.0	mg/L	28D	x	x									
Color	500 mL	SM 2120B	3.0	Color Units	48H						x			x	x	x
Organophosphate Pesticides	2 L	USEPA 625M	0.01	µg/L	7/40D[2]			x	x	x	x	x	x	x	x	x
Synthetic pyrethroids	2 L	GC/MS NCI-SIM	2-10	ng/L	7/40D[2]	x	x	x	x	x	x	x	x	x	x	x
Chlordane	2 L	USEPA 608	0.100	µg/L	7/40D[2]		x								x	
Malathion	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x									
Diazinon	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x								x	
Chlorpyrifos	2 L	USEPA 625M	0.010	µg/L	7/40D[2]	x	x	x								
Perchlorate	250 mL	USEPA 314	0.0020	mg/L	28D											x
PAHs (Polycyclic Aromatic Hydrocarbons)	2 L	USEPA 625M/ EPA 8270C SIM	0.10	µg/L	7/40D[2]		x								x	
PCBs (Polychlorinated Biphenols) Congeners	2 L	PCB Congener/ GC/MS/MS	0.010	µg/L	1Yr		x								x	
DDE (Dichlorodiphenyldichloroethylene)	2 L	USEPA 608	0.005	µg/L	7/40D[2]					x						
DDT (Dichlorodiphenyltrichloroethane)	2 L	USEPA 608	0.005	µg/L	7/40D[2]					x						
Pentachlorophenol (PCP)	2 L	USEPA 625M/ EPA 8270C	1.0	µg/L	7/40D[2]						x					
Aluminum (Al)	250 mL	USEPA 200.8	0.005	mg/L	6M						x				x	
Antimony (Sb)	250 mL	USEPA 200.8	0.0005	mg/L	6M	x	x									
Arsenic (As)	250 mL	USEPA 200.8	0.0004	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Cadmium (Cd)	250 mL	USEPA 200.8	0.0001	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Chromium (Cr)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Chromium III (Cr)	Calculated from Total Chromium and Chromium VI			mg/L	N/A											
Chromium VI (Cr)	250 mL	USEPA 218.6	0.0003	mg/L	28D											
Copper (Cu)	250 mL	USEPA 200.8	0.0005	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Iron (Fe)	250 mL	USEPA 200.7	0.010	mg/L	6M			x	x	x	x	x	x	x	x	x
Lead (Pb)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Manganese (Mn)	250 mL	USEPA 200.8	0.0002	mg/L	6M			x		x	x			x	x	x
Mercury (Hg)	250 mL	USEPA 245.1	0.00005	mg/L	28D			x	x	x	x	x	x	x	x	x
Nickel (Ni)	250 mL	USEPA 200.8	0.0008	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Selenium (Se)	250 mL	USEPA 200.8	0.0004	mg/L	6M											
Silver (Ag)	250 mL	USEPA 200.8	0.0002	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Thallium (Tl)	250 mL	USEPA 200.8	0.0002	mg/L	6M			x	x	x	x	x	x	x	x	x
Zinc (Zn)	250 mL	USEPA 200.8	0.005	mg/L	6M	x	x	x	x	x	x	x	x	x	x	x
Total coliforms	100 mL	SM 9221B	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Fecal coliforms	100 mL	SM 9221E	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Enterococci	100 mL	SM 9230B	20	MPN/100mL	8H	x	x	x	x	x	x	x	x	x	x	x
Acute Survival with *Hyalella azteca*	4L	EPA-821-R-02-012	N/A	Pass/Fail	36hr	x	x									
Larval Survival and Growth with *Pimephales promelas*	15L	EPA-821-R-02-013	N/A	Pass/Fail	36hr			x*	x*	x*	x*	x*	x*	x*	x*	x*
Survival and Reproduction with *Ceriodaphnia dubia*	4L	EPA-821-R-02-013	N/A	Pass/Fail	36hr	x	x	x*	x*	x*	x*	x*	x*	x*	x*	x*
Embryo-Larval Development with *Strongylocentrotus purpuratus*	4L	EPA-600-R-95-136	N/A	Pass/Fail	36hr			x*	x*	x*	x*	x*	x*	x*	x*	x*
Growth with *Selenastrum capricornutum*	4L	EPA-821-R-02-013	N/A	Pass/Fail	36hr	x	x	x*	x*	x*	x*	x*	x*	x*	x*	x*

[1] Nephelometric turbidity units.

[2] 7 days for sample extraction and 40 days holding for extract to be analyzed.

*If sample has salinity less than 1ppt, then tests include *Pimephales promelas,Ceriodaphnia dubia,Selenastrum capricornutum* . If sample has salinty greater than 1ppt, then tests include *Strongylocentrotus purpuratus.*