PROGRAM YEAR 2024 MONITORING PLAN

VERSION 2024.1

CENTRAL COAST LONG-TERM ENVIRONMENTAL ASSESSMENT NETWORK (CCLEAN)

DRAFT

Prepared on behalf of:

City of Santa Cruz
City of Watsonville
Monterey One Water
Carmel Area Wastewater District
City of Scotts Valley
Vistra Energy's Moss Landing Power Plant

May 16, 2024

List of Abbreviations and Acronyms

AMS	Applied Marine Sciences
CCLEAN	Central Coast Long-term Environmental Assessment Network
CCR	Coastal Conservation and Research
COC	Chain of Custody
DDT	Dichlorodiphenyltrichloroethane
DFG	Department of Fish and Game
FIB	Fecal Indicator Bacteria
KEI	Kinnetic Environmental, Inc.
MBNMS	Monterey Bay National Marine Sanctuary
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
POP	Persistent Organic Pollutants
PPE	Personal Protection Equipment
PSD	Particle Size Distribution
QA	Quality Assurance
QC	Quality Control
RWQCB	Regional Water Quality Control Board
SOP	Standard Operating Procedure
SPE	Solid-phase Extraction
TOC	Total Organic Carbon
TSS	Total Suspended Sediment

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1 Introduction and Background

The Central Coast Long-term Environmental Assessment Network (CCLEAN) is a long-term monitoring program designed to help municipal agencies and resource managers protect the quality of ocean waters in the Monterey Bay area. CCLEAN determines the sources, amounts, and effects of contaminants reaching ocean waters. If the kinds and amounts of contaminants measured are impairing ocean waters, the information provided by CCLEAN will enable resource managers to implement corrective actions.

Under the auspices of the Central Coast Regional Water Quality Control Board, CCLEAN is currently supported by:

- the City of Santa Cruz,
- the City of Scotts Valley,
- the City of Watsonville,
- Carmel Area Wastewater District,
- Monterey One Water, and
- Moss Landing Power Plant.

The parties involved in implementation of CCLEAN and their responsibilities are shown in **Table 1**.

Table 1. CCLEAN personnel responsibilities.

Name	Organizational Affiliation	Title	Contact Information (Telephone number, email address.)
Aroon Melwani	AMS	CCLEAN Program Director	831-917-9243 amelwani@amarine.com
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Sean Campbell	SGS AXYS	Client Services Manager	250-655-5834 Sean.Campbell@sgs.com
Jim Oakden	CCR	Benthic Lab Director	831-479-0277 joakden@gmail.com
Misty Mercier	Physis	Project Manager	714-602-5320 MistyMercier@physislabs.com
Paul Salop	AMS	QA Officer	925-373-7142 salop@amarine.com
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1.1 Project Description

The CCLEAN monitoring program is designed to 1) determine the major sources of contaminants that are affecting beneficial uses in marine waters, 2) estimate the loads of those contaminants, and 3) determine the effects of those contaminants. To meet these goals, CCLEAN measures possible water quality stressors and their effects in ocean waters by sampling wastewater effluent, influent (City of Watsonville only), ocean waters, mussels, sediments, and benthic communities. Effluent for each municipal wastewater discharger is sampled for persistent organic pollutants (POPs), current-use pesticides, nutrients, and suspended sediments in the dry and wet season. Influent is sampled at the City of Watsonville for the same analytes as effluent, but only in the dry season. Mussels are sampled in the wet season at five locations to measure bioaccumulation of POPs and bacteria. Sediments are sampled for POPs, current-use pesticides, grain size, and total organic carbon annually, and for benthic organisms once every five years. Sediment samples are collected in the dry season within the depositional band that has been identified by U.S. Geological Survey along the 80-meter contour in Monterey Bay and at sites near presumed contaminant sources. Ocean water is sampled twice per year at two sites for concentrations of POPs, PFAS, current-use pesticides, nutrients, and bacteria.

All monitoring data collected by CCLEAN is submitted to the California Environmental Data Exchange Network (CEDEN) and made available via the CEDEN portal (http://ceden.waterboards.ca.gov/AdvancedQueryTool). Results are synthesized into reports available online at www.cclean.org.

1.1.1 Constituents Monitoring

The CCLEAN program involves multiple sampling components and measurement techniques **(Table 2**). Constituents monitored and the methods used are described in detail in the sections that follow.

Table 2. Overview of sample types and collection techniques.

Sample Type	Sampling Method
Influent and Effluent Sampling	Flow-proportioned solid-phase extraction (SPE)
Receiving Water Sampling	Grab samples
Mussel Sampling	Hand collected
Influent, Effluent, and River Sampling	Grab samples
Sediment Sampling	Van Veen sediment grab
Ocean Sampling	Time-integrated SPE and grab samples

1.1.2 Project Schedule

Sampling schedules for the CCLEAN program are shown in **Table 3**. CCLEAN reports are submitted annually to the Water Board by March 31 for the previous July–June period. As CCLEAN data are used for permit compliance, raw data for influent and effluent samples are made available to dischargers by January 31 of the year following data collection.

Table 3. Program Elements, Intervals, and Approximate Timing.

Program Element	Season	Approximate Dates
Effluent	Wet Season	January - March
	Dry Season	August - October
	Monthly	July - June
Influent	Dry Season	August - October
Rivers	Wet Season	January - March
	Dry Season	August - October
Ocean Water	Wet Season	January - March
	Dry Season	August - October
Mussels	Wet Season	February - March
Sediment	Dry Season	September - October

1.1.3 Geographic Setting

CCLEAN sampling sites span the Monterey Bay area from Scott Creek in the north to Carmel Bay in the south (**Figure 1**).

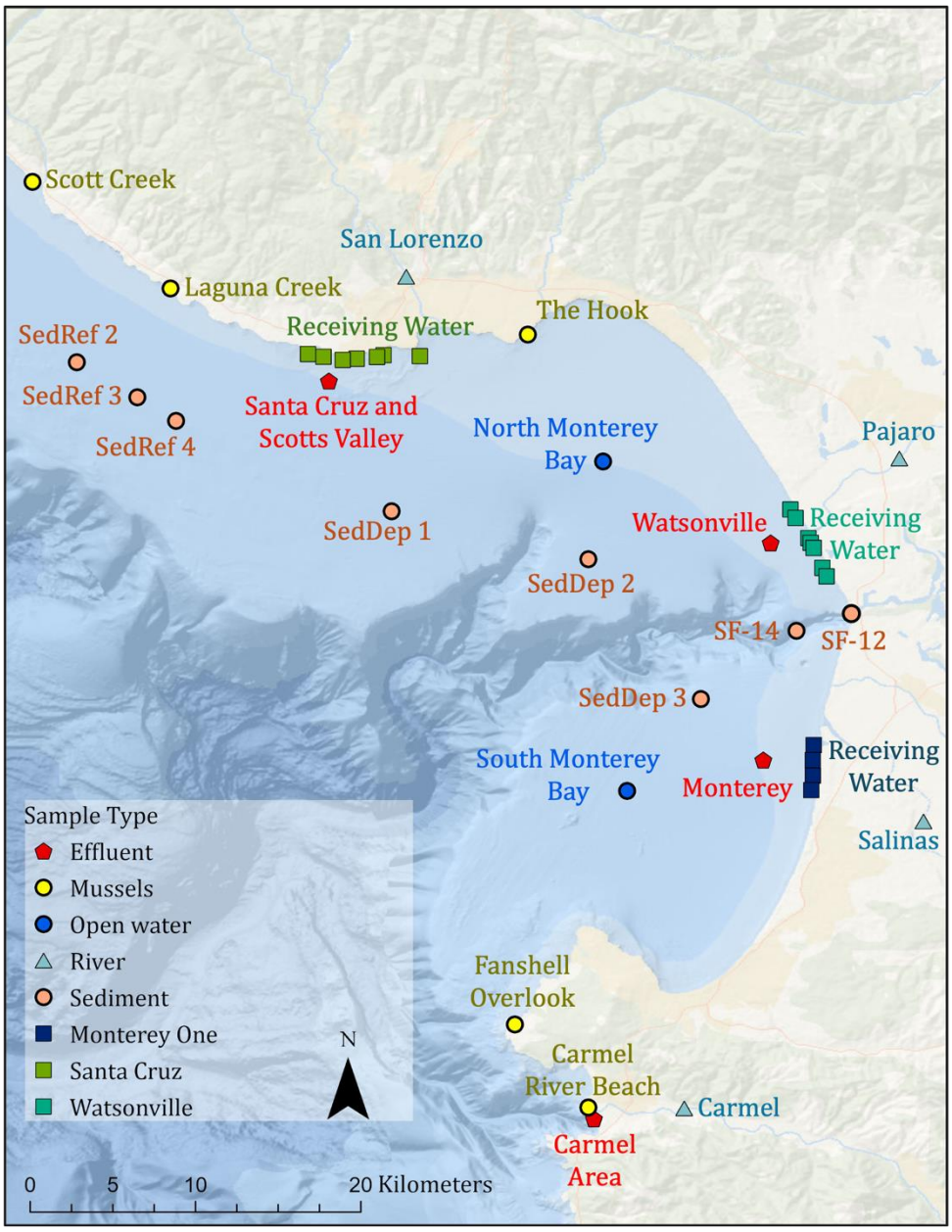

Figure 1. CCLEAN sampling sites across the Monterey Bay area that include wastewater effluent, ocean waters, mussels, sediments, and benthic communities.

1.2 Sites, Parameters, Frequency, and Intervals

CCLEAN Program Objectives are assessed over each Program Year (July 1 – June 30) by a series of monitoring elements that each employ prescribed methods to address the management and monitoring questions specified in the CCLEAN QAPP (CCLEAN 2024).

Influent and Effluent Monitoring
Five municipal dischargers are sampled twice a year for POPs using automated equipment to generate 30-day flow proportioned effluent samples during both wet and dry seasons. Influent at Watsonville is sampled only in the dry season. Additional wet and dry season grab samples are collected for pyrethroids, fipronils, neonicotinoids, and PFAS. Nutrient samples are collected monthly at each discharger site.

River Monitoring
River sites are sampled twice a year using grab samples for pyrethroids, fipronils, neonicotinoids, PFAS, nutrients, and TSS. San Lorenzo River sampling also uses automated equipment to generate 30-day flow proportioned samples during both wet and dry seasons for POPs and organophosphate pesticides with support from City of Santa Cruz.

Ocean Water Monitoring
Two ocean monitoring stations use automated equipment deployed on buoys to collect 30-day time-integrated samples in both the wet and dry seasons. These samples are analyzed for POPs and PAHs. Grab samples are also collected for nutrients and bacteria analysis at the beginning and end of the buoy deployment period.

Mussel Sampling
Composite samples of 30-40 mussels are collected annually to analyze POPs and bacteria concentrations in mussel tissue. These composite samples are collected at five sites during the wet season.

Sediment Sampling
Sediment grab samples are collected annually and analyzed for POPs, grain size, and TOC at six sites, and for current-use pesticides at a subset of sites within Monterey Bay. Two dredge disposal sites are also sampled. Single replicate benthic infauna samples are collected once every 5 years at the same sites within the bay (next scheduled for 2025).

Table 4. Sampling sites, parameters sampled, frequency of sampling, and applicable water-quality stressors.

Program Element	Sampling Sites	Parameters Sampled at Each Site	Frequency of Sampling	Applicable Water-quality Stressors
Water Sampling	Five outfall sites (Santa Cruz, Scotts Valley, Watsonville, Monterey, Carmel) in effluent	30-day flow proportioned samples using automated pumping equipment, *in situ* SPE techniques for persistent organic pollutants, composite samples for pyrethroids, fipronils, neonicotinoids, organophosphates (Santa Cruz only).	Twice per year (wet and dry season)	Pyrethroids, Fipronils, Neonicotinoids, and Nutrients in Effluent, Rivers and the Ocean. POPs in San Lorenzo River
	Three river sites (San Lorenzo, Pajaro, Salinas) near river mouths	Grab samples at all sites for pyrethroids, fipronils, neonicotinoids, TSS, and nutrients. San Lorenzo is sampled as above for persistent organic pollutants and organophosphate pesticides.	Twice per year (wet and dry season)	
	Two ocean sites	30-day time-integrated samples using automated pumping equipment and *in situ* SPE techniques for persistent organic pollutants. Grab samples twice during each sampling period for current use pesticides, urea, ammonium, nitrate, phosphate, TSS, bacteria, temperature, conductivity, and pH. Grab samples once during each sampling period for PFAS.	Twice per year (wet season and dry season)	

Program Element	Sampling Sites	Parameters Sampled at Each Site	Frequency of Sampling	Applicable Water-quality Stressors
Water Sampling	30-ft contour sites for each major discharge and sites sampled for AB 411	Grabs for nutrients	Monthly	Nutrients
		Grabs for total and fecal coliform, Enterococcus	Monthly	Fecal Indicator Bacteria
Sediment Sampling	Three inner bay sites and three outer bay sites along 80-m contour, and the two dredge disposal sites in Monterey Bay	Single samples for persistent organic pollutants, total organic carbon, grain size, and current-use pesticides. Only a subset of sites are sampled for current-use pesticides.	Annually	Persistent Organic Pollutants
	Three inner bay sites and three outer bay sites	Single samples for benthic infauna	Every five years	Persistent Organic Pollutants
Mussel Sampling	5 rocky intertidal sites	One composite of 30-40 mussels for persistent organic pollutants, total and fecal coliform, and *Enterococcus*	Annually (wet season)	Persistent Organic Pollutants and Fecal Indicator Bacteria

1.3 CCLEAN Monitoring Goals

The purpose of the CCLEAN Monitoring Program is to measure the sources, loads, and effects of pollutants discharged to Monterey Bay during the current Program Year (July1-June 30) and place annual results within the context of historic data. The CCLEAN monitoring fulfills part of the receiving water compliance monitoring requirements of the CCLEAN participants' National Pollutant Discharge Elimination System (NPDES) permits. CCLEAN is also the mechanism by which the Central Coast Water Board currently fulfills part of its obligations under a monitoring framework to provide an ecosystem-based Water Quality Protection Program for the MBNMS. The purpose of this Monitoring Plan is to describe the sites, methods, parameters, and frequency of sampling. CCLEAN participants are required to individually review this Monitoring Plan prior to approval of the CCLEAN budget each Program Year. By July 1, a copy of this Monitoring Plan will be submitted to the Water Board as an attachment to the current CCLEAN Quality Assurance Program Plan.

1.4 CCLEAN Oversight

Each CCLEAN participant appoints one representative to the Steering Committee. The Steering Committee, alongside a representative of the Central Coast Water Board, provides oversight and technical expertise to ensure Program goals are achieved.

2 Quality Assurance Objectives

A comprehensive data quality assurance and quality control (QA/QC) program covering all aspects of water, sediment, and mussel tissue monitoring will be implemented as part of this Monitoring Plan. QA/QC for the collected data will be performed according to procedures detailed in the CCLEAN Quality Assurance Program Plan (QAPP; CCLEAN 2024), which addresses all aspects of the proposed monitoring and assessment.

3 Sampling Design

CCLEAN measures inputs to the ocean of the identified potential water quality stressors (i.e., POPs, PFAS, current-use pesticides, nutrients and pathogens) and effects in ocean waters by sampling wastewater effluent, rivers, ocean waters, mussels, sediments, and benthic communities, using a judgmental design. Effluent for each of the five municipal dischargers are sampled twice per year using automated equipment to obtain 30-day flow-proportioned samples. Effluent and river grab samples also are collected in the wet and dry seasons. Mussels are sampled annually in the wet season at five locations. Sediments are sampled at six sites annually for contaminants and every five years for analysis of benthic infauna. Finally, ocean water is sampled twice per year at two sites. See Figure 1 for locations of sampling sites.

3.1 Monitoring Elements

The types, numbers and approximate timing of samples to be collected each year are as follows:

Effluent

- 250-liter samples collected twice per year for the analysis of POPs, during 30-day periods in the wet season and in the dry season; 5 sites x 2 times per year = 10 samples per year.
- Monthly samples collected for nutrients; 4 sites x 12 samples = 48 samples per year.
- Grabs collected for pyrethroids, fipronils, neonicotinoids, and PFAS twice per year 5 sites x 2 samples = 10 samples per year.

Rivers

- 250-liter sample collected twice per year for the analysis of POPs over a 30-day period in the wet and dry seasons from the San Lorenzo River = 1 site x 2 times per year = 2 samples, supported exclusively by City of Santa Cruz.
- Grab samples for nutrients collected twice per year from three rivers = 3 sites x 2 samples = 6 samples per year.
- Grabs collected for pyrethroids, fipronils, neonicotinoids, and PFAS twice per year; 3 sites x 2 samples = 6 samples per year.

Ocean Water

- 250-liter samples collected twice per year for the analysis of POPs, during 30-day periods in the wet season and in the dry season; 2 sites x 2 times per year = 4 samples per year.
- Grabs for nutrients and bacteria collected from each site at the beginning and end of the buoy deployment period; 2 sites x 8 samples = 16 samples per year. Single grabs collected for analysis of PFAS; 2 x 2 = 4 samples per year.

Mussels

- Annual collection of single replicates from each of five sites plus a field duplicate consisting of composites of 30–40 individuals for analysis of POPs and bacteria; 5 sites + 1 x 1 sample = 6 samples per year.

Sediment

- Samples collected from six fixed sites + 1 field duplicate for the analysis of POPs, total organic carbon, and grain size annually (a subset are also used for analysis of current-use pesticides); 6 + 1 sites x 1 sample = 7 samples per year.
- An additional two sites where dredge material from harbors in Monterey Bay is disposed may be sampled in some years; 2 sites x 1 sample = 2 samples per year

- Collection of single replicates every five years from each of the six fixed sites for analysis of benthic infauna; 6 sites x 1 sample = 6 samples every five years.

Samples for POP, current-use pesticides, TOC, and grainsize analysis will be shipped to the laboratory for analysis as soon after they are collected from the field as possible, although mussel tissues will be removed from the shells and homogenized before being shipped. Samples for bacteria and nutrient analyses will be delivered to the laboratory for analysis as soon as possible after being collected.

All the data collected by CCLEAN are used to achieve its objectives and there are no data that are collected for informational purposes only.

3.2 Sampling Uncertainty

There are multiple sources of potential sampling uncertainty associated with the implementation of CCLEAN, including: (1) measurement error; (2) natural (inherent) variability; (3) sample misrepresentation (or poor representativeness); and (4) sampling bias (statistical meaning). Measures incorporated to address these areas of uncertainty are discussed below:

1. Measurement error combines all sources of error related to the entire sampling and analysis process (i.e., to the measurement system). All aspects of dealing with uncertainty due to measurement error have been described in the QAPP (CCLEAN 2024).

2. Natural (inherent) variability occurs in any environment monitored and is often much wider than the measurement error. This inherent variability will be taken into consideration when interpreting results of the various lines of inquiry.

3. Sample misrepresentation happens at the level of an individual sample or field measurement where an individual sample collected is a poor representative for overall conditions encountered. To address this situation, CCLEAN has been developing and implementing a number of QA-related measures, including training and auditing of field crews to ensure their proper implementation.

4. Sampling bias relates to the sampling design employed and whether the appropriate statistical design is employed to allow for appropriate understanding of environmental conditions. Potential sources of bias include sampling and analytical methods. In the case of sampling, bias is controlled by using prescribed methods to provide repeatable results. For example, if samples are collected in a systematic way that targets specific types of organisms (e.g., mussels of a certain size), and there is inconsistency in the types of organisms collected in each sampling effort, bias is introduced, insofar as analytical measurements might vary according to organism type. This type of bias also

could occur if different sieve mesh sizes were used each time for removing benthic infauna from sediment. These potential sources of bias are controlled by always collecting mussels of approximately the same size from all locations and by using a standardized sieve mesh size for processing all benthic samples. Sampling bias can also be introduced by using sampling methods that do not effectively collect certain types of analytes. For example, the *in situ* SPE method used by CCLEAN for sampling POPs does not adequately sample highly polar compounds. This type of bias is controlled by only analyzing non-polar compounds.

5. Analytical bias is introduced if measurement methods are either more or less accurate under different ambient conditions or if they inherently misrepresent the actual concentration of an analyte. Applying Quality Control limits to measurements of reference performance spikes and laboratory spikes helps control the former type of analytical bias in water samples for analysis of POPs. Control of this type of bias in other samples is done primarily through examination throughout the analytical process for interferences due to matrix effects. Bias due to inherent misrepresentation of analyte concentrations is controlled by requiring analysis of certified reference materials, laboratory reference materials or standards.

4 Sampling Methods

The CCLEAN program comprises multiple sampling components as outlined previously. A brief summary of each is provided below. Any problems that occur during sampling are reported immediately to the Program Director by the respective Field Program Manager and corrective actions are taken, when possible. A Sampling Report is submitted within four weeks following the completion of sampling that provides information on actual sampling dates, duration of sampling efforts, unusual conditions or problems encountered, and corrective actions taken.

4.1 Wastewater Influent and Effluent

Effluent sampling includes collection of 30-day flow-proportioned samples twice per year (i.e., in the wet season and in the dry season) for analysis of POPs. A single, dry season influent sample is also collected at the City of Watsonville using 30-day flow-proportioned sampling methods. Annual loads of POPs are estimated by calculating the average daily load during each sampling period (average flow multiplied by average flow-proportioned concentration) and multiplying the average load from both sampling periods by 365. The objective of this sampling component is to estimate the loads to Monterey Bay of POPs in influent from the City of Watsonville and in effluent from all of the CCLEAN POTWs.

CCLEAN employs an *in situ* SPE process for sampling POPs in influent and effluent that captures contaminants in both the particulate and dissolved phases. This sampling method is discussed in greater detail in Section 4.1.1. A complete list of the constituents measured in effluent by CCLEAN can be found in Section 13 (Analytical Methods) of the CCLEAN QAPP (CCLEAN 2024). A

summary of these analytes is provided in **Table 5**.

4.1.1 Solid-Phase Extraction Sampling

The collection of 30-day flow-proportioned samples of influent and effluent is accomplished by Kinnetic Environmental, Inc. (KEI) using specialized equipment (**Figure 2**). Off-the-shelf equipment was obtained from suppliers and configured for each sampling location. Programmable ISCO 6712 autosamplers are used to pump water through glass-fiber particle filters and stainless-steel columns packed with XAD-2 resin beads, which were obtained from SGS AXYS Environmental. Handling of the particle filters and XAD-2 columns is performed according to the SGS AXYS Infiltrex 300 User's Manual in Appendix B. All sampler tubing is composed of Teflon™, silicone (pump tubing), nylon and stainless steel, which undergoes a thorough cleaning process prior to use. The samplers are programmed to pump 1 liter of sample through the filter and column in response to electrical signals from the flow meter in each treatment plant. The ISCO pumping rate is within the optimum range (i.e., 0.75–1.25 L/minute) for efficient capture of POPs by the resin beads. The estimated flow at each site is projected to ensure that the target volume of sample will be pumped through the filter and column over an approximately 30-day period. Two hundred fifty liters is the target volume to ensure the lowest possible detection limits for POPs. Dry-season influent and effluent samples are targeted for collection during the months of August–September and wet-season effluent samples are collected during the months of January–March. An equipment blank sample is collected for each sampling period by pumping ultra-pure water through the equipment.

The SOPs that apply to this sampling task are as follows:

- KLI –CCL-2006002-02 (28 Oct. 2008) for CCLEAN Solid-Phase Extraction Column and Glass Fiber Filter Handling Procedures and
- KLI –CCL-2019001-01 (17 April 2019) for CCLEAN Teflon Sample Tubing, Silicon Peristaltic Tubing, Silicon Tubing, Teflon Check Valve, Stainless Steel Glass Fiber Filter Canister, and Ocean Micropump Cleaning Procedures.

These SOPs from KEI are proprietary and are available for examination at the Program Director's office in Santa Cruz, CA.

4.1.2 Grab Sampling

Influent and effluent grab samples are collected by personnel of the program participants and analyzed for various constituents. Nutrients are analyzed in participant's laboratories, and pyrethroids, fipronils, neonicotinoids, and PFAS are analyzed in contract laboratories. The grabs by plant personnel are collected monthly for analysis of dissolved silica, orthophosphate, ammonia, nitrate, urea, total suspended solids, temperature, and pH (Error! Reference source not found.). All grabs are taken from the influent and effluent stream at the point where samples are collected for the regular effluent monitoring required under each NPDES permit. Annual loads of these constituents are estimated by calculating the load on each sampling date

(flow multiplied by concentration) and multiplying the average load among all samples by 365. The objective of this sampling component is to estimate the loads to Monterey Bay of nutrients from effluent. SOPs for collection of grab samples are based on EPA-approved methods and are on file at each wastewater treatment plant.

Table 5. Summary of POP Constituents Analyzed in Water, Sediment, and Mussel Tissue Samples.

Matrix	Parameter Type	Analytical Methods
Water	PAHs	SGS AXYS MLA-021
	Cyclopentadienes	SGS AXYS MLA-228
	Chlordanes	SGS AXYS MLA-228
	DDTs	SGS AXYS MLA-228
	HCH	SGS AXYS MLA-228
	Fipronil & Degradates	EPA 625-NCl
	Pyrethroid Pesticides	EPA 625-NCl
	Neonicotinoid Pesticides	EPA 625
	Organophosphorus Pesticides	EPA 625
	PCB Congeners	SGS AXYS MLA-210
	Dioxins and Furans[1]	SGS AXYS MLA-217
	PFAS[2]	SGS AXYS MLA-110
Sediment	PAHs	SGS AXYS MLA-021
	DDTs	SGS AXYS MLA-228
	Cyclopentadienes	SGS AXYS MLA-228
	PCB Congeners	SGS AXYS MLA-210
Mussels	Cyclopentadienes	SGS AXYS MLA-228
	DDTs	SGS AXYS MLA-228
	Chlordanes	SGS AXYS MLA-228
	HCHs	SGS AXYS MLA-228
	PCB Congeners	SGS AXYS MLA-210
	Tissue Lipid / moisture content	N/A

[1] Wastewater only, [2] Rivers and Ocean only

Table 6. Summary of non-POP Constituents Analyzed in Water, Sediment, and Mussel Tissue Samples.

Matrix	Parameter Type	Analytical Methods
Water	Nutrients (Dissolved)	EPA 350.1 (Ammonia as N)
		EPA 353.4 (Nitrate as N)
		EPA 365.5 (OrthoPhosphate as P)
		EPA RO-HS-2 (Urea as N)
		Grasshoff and Kremling (1983) (Silicate as Si)
	Pathogens	SM 9230B, SM 9230C or Enterolert (Enterococcus) SM 9221E, SM 9222D or Colilert (Coliform, Fecal) SM 9221B, SM 9222B or Colilert (Coliform, Total)
	General Water Quality	EPA 160.2, SM 2540D (Total Suspended Solids)
		EPA 0170.1 (Temperature)
		EPA 150.1, SM 4500HB (pH)
Sediment	Particle Size Distribution	SM 2560 (Gravel, Silit, Sand, Clay)
	Ancillary	EPA 9060M (Total Organic Carbon) Lauenstein and Cantillo (1993) (Moisture)
Sediment (Benthic Infauna)	Specific Identification	Laboratory SOP
Mussels	Ancillary	Lauenstein and Cantillo (1993) (Moisture, Lipid)
	Pathogens	American Public Health Association (1970) (Enterococcus, Fecal Coliform, Total Coliform)

4.2 Receiving Water Sampling

Receiving water sampling consists of monthly or more frequent sampling for pathogen indicators at stations along the 30-foot contour near the wastewater discharges of Santa Cruz, Watsonville, and Monterey One Water. Measurements are made for total coliform, fecal coliform, and *Enterococcus* bacteria. Samples are collected by boat from the top foot of the water column and placed into pre-sterilized Whirlpak® containers or plastic jars. Carmel is required to sample beach sites if their effluent concentration of total coliform exceeds 2,400 Most Probable Number (MPN)/100L three or more times in a 30-day period. Collections are made by treatment plant personnel from Santa Cruz, Watsonville, Monterey One Water, Carmel or their consultants, according to the requirements of their respective NPDES permit monitoring and reporting programs and analyzed in the respective treatment plant laboratories. Locations of receiving water monitoring sites for each agency are described in **Table 7.** SOPs for collection of receiving water samples are based on EPA-approved methods and are on file at each wastewater treatment plant.

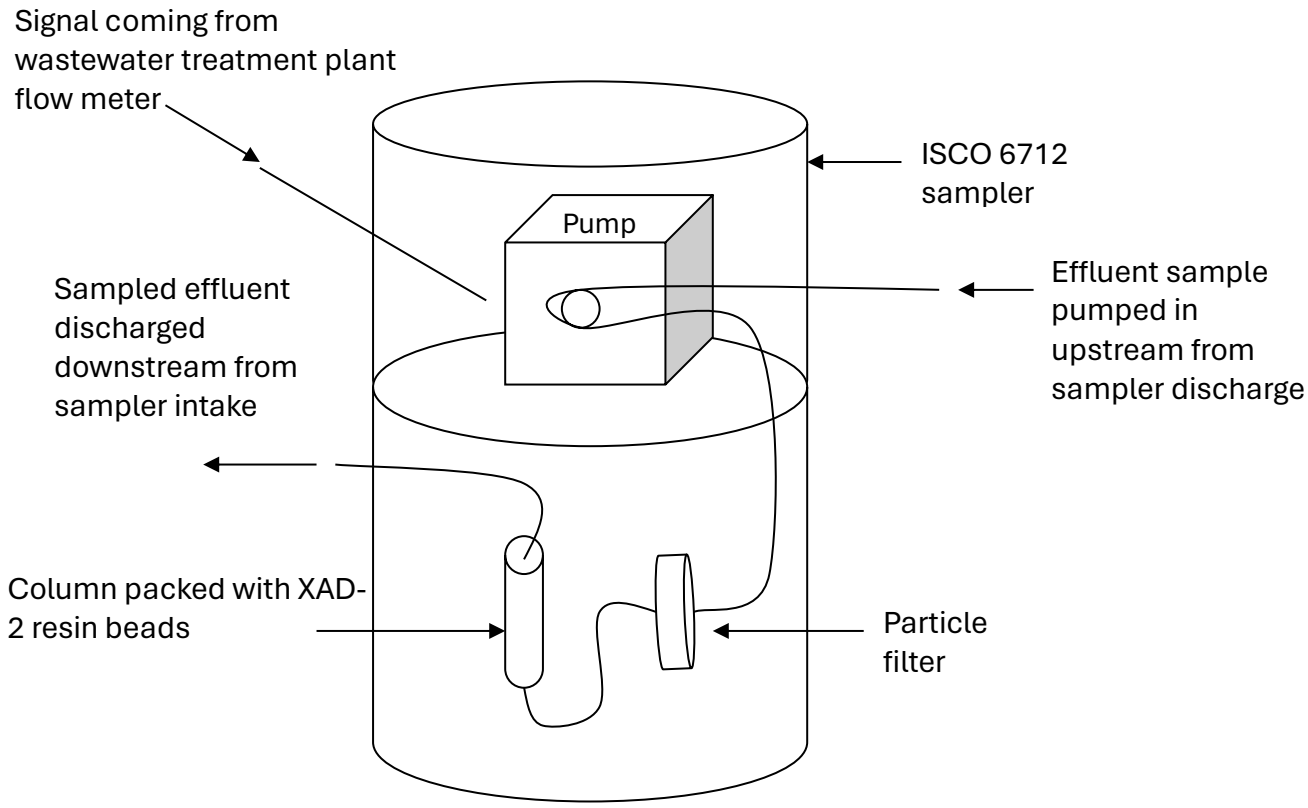

Figure 2. Configuration of ISCO samplers for CCLEAN influent and effluent sampling.

Table 7. Locations of receiving water-monitoring sites for each CCLEAN discharger.

Agency	Site	Location
Santa Cruz	RW(A)	Point Santa Cruz
	RW(C)	Old outfall
	RW(E)	610 m upcoast of old outfall
	RW(F)	Natural Bridges
	RW(G)	Terrace Point
	RW(H)	1180 m upcoast of Terrace Point
	RW(I)	2080 m upcoast of Terrace Point
Watsonville	A	2000 m north of outfall
	B	1500 m north of outfall
	C	300 m north of outfall
	D	Adjacent to outfall
	E	300 m south of outfall
	F	1500 m south of outfall
	G	2000 m south of outfall
	ZID	Edge of zone of initial dilution
Monterey One Water	A	900 ft north of outfall
	B	Adjacent to outfall
	C	900 ft south of outfall
	D	1800 ft north of outfall
Carmel Area	K-4	Mission Point
	K-5	North Shore Carmel River Mouth
	K-6	Point at North end of Monastery Beach

4.3 Mussel Sampling

Mussel sampling consists of collecting mussels from five sites (**Table 8**) once a year, during the wet season, for analysis of POPs and bacteria. The objective of this program element is to determine the extent to which humans and sea otters might be exposed to POPs and pathogens from consumed components of the food web. Mussel sampling is being performed by KEI, with POP analyses analyzed by SGS AXYS and bacteria analyzed by Sonoma County Public Health Laboratory. Seventy mussels, 40-60 mm in shell length, are collected at each site. A sixth sample is collected at one of the five sites that is submitted to the laboratories as a blind field duplicate for QA/QC purposes. Mussel collection and processing will be consistent with the California Department of Fish and Wildlife's most recent Standard Operating Procedures (DFG SOP 102). Collection and processing of mussels for this task is performed according to SOP KLI –CCL-2006003-01. This proprietary SOP is available for examination at the Program Director's office in

Santa Cruz, CA. Samples and equipment are handled with polyethylene-gloved hands only. In addition, gloves will be changed between the handling of different samples. Mussels will be collected from the rocks by gloved hands.

Mussels collected from each site are stored in two separate pre-cleaned heavy-duty aluminum foil. Mussels will only contact the dull side of the foil. Forty mussels will be placed in one bag for the chemical analysis of POPs. Thirty mussels will be placed in the second bag for the microbiological samples to be analyzed for pathogen indicator organisms by Sonoma County. Both will be labeled with a water-proof marking pen. Each foil bag will then be double-bagged in Ziploc bags. Both samples will be placed in an ice chest with double-bagged blue ice packets and maintained at 2-4°C for transfer to the laboratories. The sample for microbiological analysis will be immediately transferred to Sonoma County for initiation of the testing prior to expiration of the 24-hour holding time. In order to prevent the mussels collected for chemical analysis of POPs from gaping, resections will be conducted immediately or the next day in order to avoid the need to initially freeze the samples.

Resections will be performed at KEI in cleaned glove boxes. Equipment used to remove the tissues will be washed in a Micro detergent solution, rinsed thoroughly with tap water (to ensure removal of the detergent) and then rinsed with deionized water. This will be followed by a methanol rinse and deionized water rinse. Mussels will be individually removed from the bag and cleaned of epiphytic organisms. Mussels will be allowed to thaw, if frozen, on a precleaned sheet of heavy-duty aluminum foil. Resection will be performed over that foil with cleaned gloved hands. A pre-cleaned stainless-steel scalpel will then be used to sever the adductor mussel and remove the byssal threads. The remaining tissue, including the gonads will then be placed in certified clean glass jars and frozen at or below -20°C until ready for homogenization, extraction and analysis. Samples will be homogenized using a Brinkman™ homogenizer (PT 10 35) with a titanium generator (PT20 STI). The Brinkman™ homogenizer is designed to prevent contamination during homogenization by ensuring that sample material only contacts titanium or Teflon™ parts. The generator is cleaned at the onset of homogenization and between each sample. The generator is cleaned with a Micro™ detergent solution, rinsed two times with tap water and rinsed three times with deionized water. The homogenizer is operated at the lowest speed possible to avoid heating the sample or spattering. The tissue is homogenized to a paste-like consistency with no chunks of clearly defined tissue left in the homogenate. Samples are put on ice and shipped to SGS AXYS under chain of custody protocols for analysis.

Table 8. Site names and coordinates for CCLEAN mussel sampling locations.

Site Name	Latitude	Longitude
Scott Creek	37.042°	-122.234°
Laguna Creek	36.984°	-122.159°
The Hook	36.959°	-121.965°
Fanshell Overlook	36.584°	-121.972°

Carmel River Beach	36.539°	-121.932°

4.4 Sediment Sampling

The objectives of this program component are to measure concentrations of POPs in sediments where the sediments are most likely to be deposited after washing off the land and out of rivers, and the effects of POPs on benthic infauna. Site coordinates and depths are shown in **Table 9**. Sediment sampling is conducted by AMS, with support from other consultants. Benthic infauna are analyzed by ABA Consultants, POPs are analyzed by SGS AXYS, and total organic carbon (TOC) and grain size are analyzed by Physis.

Table 9. Names and locations of CCLEAN sediment sampling sites.

Site Name	Depth, m	Latitude	Longitude
SedRef 02	80	36.9436	-122.2102
SedRef 03	80	36.9248	-122.1773
SedRef 04	80	36.9124	-122.1562
SedDep 01	80	36.8633	-122.0394
SedDep 02	80	36.8374	-121.9318
SedDep 03	80	36.7612	-121.8715
SF-12	40	36.8020	-121.7930
SF-14	135	36.7980	-121.8190

Sediment samples are collected every year from six sites along the 80-m contour in Monterey Bay for POP analyses. The 80-m contour is where the U.S. Geological Survey (USGS) has identified the thickest layer of Holocene sediments around Monterey Bay, which represents the area where sediments washing off the land and out of the rivers have been deposited (Eittreim et al. 2002). Sampling sites were located in this area because it is where contaminants adsorbed to sediment particles are most likely to be deposited and where possible contaminant effects on benthic infauna most likely would be observed. In addition, samples for analysis of POPs may be collected from SF-12 and SF-14, the two sites approved by the US Corps of Engineers for disposal of dredged material in Monterey Bay. Samples for analysis of benthic infauna are collected from the six 80-m sites in **Table 9** every five years.

Sediment samples are collected with a modified 0.1 m^2 van Veen grab sampler. Two to three samples are taken at each station. One sample is collected for benthic infauna, while the second provides the sediment for chemistry and physical grain size analyses. These samples are not composited but retained separately.

There are several quality control procedures employed in the field. Prior to each sampling event the grab is scrubbed and rinsed with a detergent solution, rinsed with successive rinses of

hydrochloric acid, methanol, and allowed to dry in a clean location. The grab is then covered until used in the field. The grab is then rinsed with site water before use in the field. At each sampling site, the grab sampler is opened and loaded prior to moving over the water, and then the device is lowered slowly through the water column in order for it to impact the sediment surface without a bow wave. Samples will be accepted based on a minimum penetration depth of 10 cm for the biological samples and at least 7 cm for the chemistry. There should be little to no visible leakage upon recovery to the vessel, no over- penetration, and little to no visible signs of surface disturbance when the doors are opened to view the surface of the grab.

The same acceptability criteria apply to the sample used for chemistry evaluation. The sampler is placed on a support table on deck where the overlying water can be removed. The upper 2 cm of the sediment surface will then be removed using stainless steel implements and then stored in either amber glass containers or Ziploc plastic bags. Glass containers will be <~70% of capacity in order to minimize potential for breaking during the storage process. Once filled, the samples will be labeled, packaged in bubble wrap, stored in plastic coolers containing blue ice, sealed with chain-of-custody information contained in the container and sent by FedEx to SGS AXYS for analysis of POPs. Sediments also are placed in two Ziploc plastic bags for determination of grain size and total organic carbon and shipped to Physis. Similarly, when benthic samples are collected, they are shipped to CCR for biological analysis.

The SOP that applies to this sampling task is:

- CCLEAN Sediment Sampling and Analysis Plan (e.g., AMS 2023)

4.5 Ocean Water Sampling

The objective of this program component is to determine the status and trends of contaminants in background waters of Monterey Bay and whether ocean waters comply with the California Ocean Plan.

Buoys are deployed twice per year for 30-day periods at a site in northern Monterey Bay and at a site in southern Monterey Bay (**Table 10).** The buoys contain sampling equipment that collects time-integrated samples of POPs using the same particle filters and columns packed with XAD-2 resin as used in the wastewater sampling. Duplicate grabs are collected from each site at buoy deployment and buoy retrieval for analysis of total coliform, fecal coliform, enterococcus, NO_3-N, NH_3-N, urea-N, and O-PO_4, SiO_2 and TSS.

The SOPs that apply to this sampling task are as follows:

- KLI –CCL-2006002-02 (28 Oct. 2008) for CCLEAN Solid-Phase Extraction Column and Glass Fiber Filter Handling Procedures and
- KLI –CCL-2019001-01 (17 April 2019) for CCLEAN Teflon Sample Tubing, Silicon Peristaltic Tubing, Silicon Tubing, Teflon Check Valve, Stainless Steel Glass Fiber Filter Canister, and Ocean Micropump Cleaning Procedures.

These SOPs from KEI are proprietary and are available for examination at the Program Director's

office in Santa Cruz, CA. Collection of bacteria, nutrient and TSS samples are according to EPA-approved protocols.

Table 10. Locations of sites for sampling ocean water in Monterey Bay.

Site	Latitude	Longitude
North Monterey Bay	36.890	-121.924
South Monterey Bay	36.711	-121.911

4.6 River Sampling

Rivers discharging into Monterey Bay have been found to contribute significant loads of pollutants to ocean waters. The objective of this program component is to quantify the concentrations and annual loads of pollutants entering Monterey Bay from river discharges.

Samples for all POPs, except dioxins/furans are collected from the San Lorenzo. Starting in the current Program Year, POPs are no longer collected from the Pajaro and Salinas rivers (**Table 11**). Similar to the influent and effluent sampling, POP sampling on the San Lorenzo River is flow proportioned using particle filters and columns packed with XAD-2 resin.

On all three rivers (San Lorenzo, Pajaro, Salinas) grabs are collected for pyrethroids, fipronils, neonicotinoids, PFAS, TSS, and nutrients. All river sampling occurs twice per year, once in the wet season and once in the dry season. The SOPs that apply to this sampling task are as follows:

- KLI –CCL-2006002-02 (28 Oct. 2008) for CCLEAN Solid-Phase Extraction Column and Glass Fiber Filter Handling Procedures and
- KLI –CCL-2019001-01 (17 April 2019) for CCLEAN Teflon Sample Tubing, Silicon Peristaltic Tubing, Silicon Tubing, Teflon Check Valve, Stainless Steel Glass Fiber Filter Canister, and Ocean Micropump Cleaning Procedures.

These SOPs from KEI are proprietary and are available for examination at the Program Director's office in Santa Cruz, CA.

Table 11. Site names and coordinates for CCLEAN river sampling locations.

Site Name	Latitude	Longitude
San Lorenzo River	36.991	-122.031
Pajaro River	36.89222	-121.763
Salinas River	36.695	-121.75

4.7 Responsibility and Corrective Action

If sampling or logging equipment fails, sampling personnel will report the problem in the comments section of their field notes and sampling report. Where feasible, numbers of samples collected will be estimated. Actions will be taken to replace or repair broken equipment prior to the next field use. Under no condition will data be entered into the CEDEN database that were known to be collected with faulty equipment.

5 Sample Handling and Custody

In the field, all samples will be packed in wet ice or frozen ice packs (blue ice) during shipment, so that they will be kept at approximately 4°C. Samples will be shipped in insulated containers. All caps and lids will be checked for tightness prior to shipping. All samples will be handled, prepared, transported and stored in a manner so as to minimize bulk loss, analyte loss, contamination, or biological degradation. Sample containers will be clearly labeled with an indelible marker. Where appropriate, samples may be frozen to prevent biological degradation. Water samples will be kept in Teflon™, glass, or polyethylene bottles and kept cool at a temperature of 4°C until analyzed. Maximum holding times for specific analyses are listed in **Table 12,**

Table 13**,**

, and Table 14. Ice chests are sealed with tape before shipping. Samples are placed in the ice chest with enough ice and appropriate packing material to completely fill the ice chest.

Because of the importance of program samples and analytical data, sample Chain-of-Custody (COC) must be controlled and documented in the laboratory. Sample custody and document control procedures function to identify and document tracking and handling of samples and documents. COC procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. Each sampling contractor / laboratory provides its own COC. A complete COC form is to accompany the transfer of samples to the analyzing laboratory. COC forms are placed in an envelope and taped to the top of the ice chest or they may be placed in a plastic bag and taped to the inside of the ice chest lid. It is assumed that samples in tape-sealed ice chests are secure whether being transported by staff vehicle, by common carrier, or by commercial package delivery. The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation and holding times during the sample login process. Contract laboratories will follow sample custody procedures outlined in their QA plans. At a minimum, the login documentation will indicate the sample identification, including dates collected and received, identity of the sampler, the analyses requested, as well as the use of proper containers and preservatives. Any deviations from required sampling techniques (e.g. wrong container type, not enough sample) are noted on the sample log form. Contract laboratory QA plans are on file with the respective laboratory. All samples remaining after successful completion of analyses will be held by the analytical laboratory until authorized by the Program Director to dispose of them properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals.

Table 12. Sample handling and custody for CCLEAN aqueous samples.

Parameter	Container	Volume	Initial Preservation	Holding Time
Total coliform, fecal coliform, Enterococcus,	2 Whirl-Pak bags per site	125 mL	Sodium thiosulfate	8 hrs
Nitrate, orthophosphate	Nalgene high-density polyethylene	60 mL	Vacuum-filtered (0.45 μm), cool to ≤6°C	48 hrs at ≤6 °C in the dark
Urea	Sterile polypropylene centrifuge tube	50 mL	Cool to ≤6°C	30 days frozen

Parameter	Container	Volume	Initial Preservation	Holding Time
Ammonia	I-Chem high-density polypropylene	125 mL	Sulfuric acid	28 days at ≤6 °C
Total suspended solids, dissolved silica	Nalgene high-density polypropylene	250 mL	None	7 days at ≤6 °C
Pyrethroids, fipronils, neonicotinoids, organophosphates, and phenolics	Amber glass bottle	2 @ 1 liter	Cool to ≤6°C	?
PFAS	High-density polyethylene	500 mL	Cool to ≤6°C	90 days
PAHs, PCBs, Dioxins, Furans, Pesticides	SGS AXYS stainless-steel column packed with XAD-2 resin beads and SGS AXYS glass-fiber particle filter	≈250 liters	Cool to ≤6°C with blue ice	Keep at ≤6 °C, dark, no limits on holding time prior to extraction

Table 13. Sample handling and custody for CCLEAN sediment samples.

Parameter	Container	Volume	Initial Preservation	Holding Time
Conventional (Grain Size, TOC)	Plastic jar	125 mL	Cool to ≤6°C, dark	Keep at ≤6 °C up to 6 months for grain size; keep at ≤6 °C up to 28 days, up to 1 year frozen for TOC
Benthic samples	Glass jars	Various	Relax with $MgCl_2$, fix with 10% formalin/sea water, preserve with 70% ethyl alcohol	Indefinite
PCBs, Pesticides	Pre-cleaned, certified amber glass jar, with Teflon lid-liner	250 mL	≤6°C, dark	Hold at -20°C, dark, up to one year

Table 14. Sample handling and custody for mussel samples.

Parameter	Container	Volume	Initial Preservation	Holding Time
Mussels, POPs	Pre-cleaned aluminum foil bags (1/site), double wrapped in Ziploc bags	40 mussels	Stored on blue ice	24 hours before resection, then frozen at -20°C
Mussels, pathogen indicators	Pre-cleaned aluminum foil bags (1/site), double wrapped in Ziploc bags	30 mussels	Stored on blue ice	24 hours

6 Documentation and Records

6.1 Field Data

All records, except lab records, generated by this project will be stored at the responsible contractor's office. Electronic data, including field sampling and other reports when appropriate, are stored on the Program Director's secure business account with the online cloud storage service Microsoft SharePoint®, where data are automatically and continuously backed up.

All analytical records are submitted by SGS AXYS and Physis electronically in Excel® spreadsheets in a format that is specified to make it easier to perform quality assurance checks and submit data to CEDEN via the Moss Landing Marine Laboratories data node.

Copies of this monitoring plan will be distributed to all parties on the distribution list. Any future amended CCLEAN Monitoring Plans will be held and distributed in the same fashion. All originals of this and subsequent amended Monitoring Plans will be held at the Program Director's office. Copies of versions, other than the most current, will be discarded so as not to create confusion. A current version of the CCLEAN Monitoring Plan is posted on the organization's website to provide access to stakeholders at all times.

Persons responsible for maintaining records for this project are shown in

Table 15.

Table 15. Responsibilities for Record Collection and Maintenance.

Name	Organizational Affiliation	Records	Retention (yeaSrs after contract end)
Aroon Melwani	CCLEAN Program Director	Lab reports, sampling plans, sampling reports	5
Paul Salop	CCLEAN QAO	QA Reviews	5
Greg Cotten	KEI	Lab reports for influent, effluent, ocean, and mussel sampling, Field datasheets, COCs	5
Sean Campbell	SGS AXYS	Lab records for influent, effluent, ocean, mussel and sediment POPs	5
Misty Mercier	Physis	Lab records for effluent, ocean water sampling	5
Jim Oakden	CCR	Field datasheets, lab records for benthic sampling	5
Michael Ferris	Sonoma County Public Health Lab	Lab records for pathogens analysis	5

The Project Director will oversee the actions of these persons and will arbitrate any issues relative to records retention and any decisions to discard records. Copies of all records will be maintained by the applicable field-sampling contractor or analytical laboratory for at least five years after project completion.

6.2 Sample Labeling

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking at laboratories. At a minimum, the sample labels will contain the following information: station ID and date of collection. All CCLEAN Site IDs are listed in **Table 16**.

Table 16. All Sites Used for CCLEAN Monitoring

CCLEAN Element	Site ID	Site	Latitude	Longitude
Ocean	NoMoBay	North Monterey Bay	36.890	121.924
Ocean	SoMoBay	South Monterey Bay	36.711	121.911
Sediment	SedRef-02	Ref2	36.9436	-122.2102
Sediment	SedRef-03	Ref3	36.9248	-122.1773
Sediment	SedRef-04	Ref4	36.9124	-122.1562
Sediment	SedDep-01	Dep1	36.8633	-122.0394
Sediment	SedDep-02	Dep2	36.8374	-121.9318
Sediment	SedDep-03	Dep3	36.7612	-121.8715

Sediment	SF-12	SF 12	36.802	-121.793
Sediment	SF-14	SF 14	36.798	-121.819
Mussels	Scotcre1	Scott Creek	37.042°	-122.234°
Mussels	Lagucre1	Laguna Creek	36.984°	-122.159°
Mussels	TheHook1	The Hook	36.959°	-121.965°
Mussels	Fanshel1	Fanshell Overlook	36.584°	-121.972°
Mussels	CarmRiv1	Carmel River Beach	36.539°	-121.932°
River	PajRiv3	Pajaro River	36.89222	-121.763
River	SalRiv3	Salinas River	36.695	-121.75
River	SLorRiv2	San Lorenzo River	36.991	-122.031
Effluent	SCruEff	Santa Cruz	Multiple	
Effluent	SValleyEff	Scotts Valley	Multiple	
Effluent	WatsEff	Watsonville	Multiple	
Effluent	MontEff	M1W	Multiple	
Effluent	CarmEff	CAWD	Multiple	
Influent	WatsInf	Watsonville	Multiple	

Each sample collected for the project will be labeled according to the following naming convention:

SITE-YYYYMMDD-CC

where:

SITE = Site ID (e.g., NoMoBay)
YYYYMMDD = Starting date for the monitored event (i.e., date of initial precipitation)

Labels should be waterproof and affixed to the individual sample containers by use of water-proof tape, cable tie, or other means that will not be subject to tearing, falling off, or other loss.

6.3 Sample Chain-of-Custody Forms

All samples transferred for analysis will be accompanied by a chain-of-custody (COC) record. The COC will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone’s physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are transferred or shipped, the custody of the samples will be the responsibility of the field collecting organization. The sampling team leader or their designee will sign the COC in the "relinquished by" box and note the date and time.

7 Quality Control

Field personnel will strictly adhere to the QAPP (CCLEAN 2024) to ensure the collection of representative unbiased samples. The most important aspects of quality control associated with sample collection, assessments, and reporting are as follows:

- Experienced field personnel will be present for all sampling activities.
- Field personnel will be thoroughly trained in the proper use of sample collection equipment and will be able to distinguish acceptable versus unacceptable samples in accordance with pre-established criteria presented in the relevant KEI or AMS SOP.
- All sampling events will be scheduled with concurrence of the Program Director and the lead person for KEI.
- Field personnel will be thoroughly trained in sample handling techniques and labelling, with particular attention given to the collection of the appropriate sample in the appropriate - storage containers.

Field Equipment, Maintenance, and Calibration

Field measurement equipment will be checked for operation in accordance with the manufacturer's specifications. This includes battery checks, routine replacement of disposable parts, and cleaning as required. All equipment will be inspected for damage at a minimum when first installed / used and when returned from use. Contractors performing sampling operations will be responsible for ensuring that all equipment in their use is maintained properly. Spare parts for all field equipment are stored at the respective field sampling contractor facilities. Any equipment deficiencies that occur during sampling will be corrected immediately by trained field personnel. Impairments of samples due to equipment problems will be reported to the Program Director as soon as possible and solutions agreed upon. All such sampling problems will be reported in the Sampling Report.

Pumps used for collecting water samples are calibrated by collecting water discharged from the sampling instrumentation for direct measurement of volume.

Field sampling contractors are responsible for inspection / acceptance of all project-related materials. Contractors and laboratories will perform inspections per the acceptance criteria within their respective SOPs.

7.1 Field Performance Measurements

Following is a list of definitions of field performance measurements that are frequently included in sampling protocols. Some of these measurements only need to be taken when an established procedure is changed, while others should be taken at various intervals throughout the sampling process.

- Source Solution Blanks - account for any pre-existing contamination in the water or preservatives used to prepare the sample containers as well as the field or travel blanks.
- Bottle Blanks - account for contamination in sampling containers, in addition to any contamination due to the source solution.

- Reference Performance Spikes - spiked onto XAD-2 resin to determine retention of POPs during field sampling.
- Travel Blanks - account for contaminants introduced during the transport process between the laboratory and field site, in addition to any contamination from the source solution and container.
- Equipment Blank - account for contamination introduced by the field sampling equipment.
- Field Duplicates - account for the sum of variability from the field and laboratory.
- Field Blanks - account for all of the above sources of contamination that might be introduced to a sample as well as that which would be due to the sampling equipment and the immediate field environment. Field blanks are generated under actual field conditions and are subjected to the same aspects of sample collection, field processing, preservation, transport, and laboratory handling as the environmental samples. Field blanks for water generally consist of ultra-pure water and those for sediment analyses generally consist of ultra-pure sand. True field blanks for biological tissue samples do not exist.

7.1.1 CCLEAN Field Measurement Standards

Routine preparation, collection, and analysis of all the blanks and duplicates mentioned above would be redundant and inefficient. Since POPs in effluent and environmental water samples are orders of magnitude lower than in sediments or tissues, extreme care must be taken in the handling and analysis of effluent or water samples. Ultra-pure solvents and materials will be used in all aspects of cleaning, storage, and analysis. The SPE columns and pre-filters will be cleaned and the cleaning process will be verified by analytical results of final solvent rinses. Contamination of solvents and source solutions will be routinely checked, and corrective steps taken whenever contamination is indicated. Certified clean borosilicate glass containers will be used for sediment and tissue samples.

Although travel blanks are not routinely used for water, sediment, or tissue samples, they may be implemented in the future. In the meantime, the possibility of contamination during the transport between the laboratory and field site will be mitigated by the measures taken to keep the sample bottles in an enclosed clean environment.

Deuterated compounds are spiked onto the XAD-2 resin beads before deployment for sampling. These compounds are analyzed in the laboratory to determine retention of captured contaminants during field sampling. Low recoveries of these deuterated compounds could indicate losses during the sampling period.

An equipment blank for POP water samples is collected once per sampling effort from a randomly selected sampling apparatus. Two-hundred liters of filtered and cleaned municipal water will be pumped through the sample tubing connected to SPE columns and filters. The sample will be exposed to the interior of the sampler tubing and all fittings, all of which will have been rigorously cleaned with ultra-pure solvents. Sediments will be collected with grab

sampler coated with a chemically-inert coating, but equipment blanks will not be taken. Since bivalves will be hand collected, equipment blanks are not relevant for tissue samples.

Field duplicates will be collected for mussel sampling. Duplicate samples will be used to evaluate sampling precision and environmental variability.

True field blanks are not routinely collected in this field and are not routinely reported in the literature. Instead, samples will be collected and handled in ways that minimize contamination. For POP sampling, containers will be routinely checked for contamination, and plastic material for storage, transport, and protection of samples will be avoided. Only ultra-pure solvents will be used in the preparation of the XAD resin and filters. The XAD resin and filters will remain enclosed and inaccessible to aerial contamination until deployed for sampling.

Collection of true sediment field blanks also has been deemed unnecessary due to use of precautions that minimize contamination of the samples. All surfaces of sediment sampling and processing instruments coming into contact with the sample will be made of inert materials, such as Teflon® or stainless steel coated with Dykon® (or equivalent), and will be thoroughly cleaned prior to field use. Equipment also will be cleaned with Alconox® (or equivalent) detergent between stations and rinsed with hydrochloric acid, followed by methanol, to avoid any carryover contamination from one station to another. Sampling will be conducted on board ship with gloved hands and the sample will be placed into pre-cleaned certified glass jars with Teflon ® -lined lids for POP analyses.

Bivalves will be handled in the field according to established protocols of the California State Mussel Watch Program designed to minimize sample contamination. Bivalves destined for POP analysis will be wrapped in aluminum foil, placed on ice, and kept frozen until homogenization and analysis.

7.2 Field Data Management

CCLEAN monitoring data will be maintained as established in Section 9 of the QAPP (CCLEAN 2024). Hard copies of all field logs, COCs, and other data sheets will be maintained by contractors conducting field sampling operations. Electronic copies of lab reports will be stored at the Program Director’s office as well as with the responsible laboratories.

In addition, all field data will be reviewed for legibility and errors as soon as possible after the conclusion of sampling. All field data that is entered electronically will be hand-checked at a rate of 10% of entries as a check on data entry. Any corrective actions required will be documented in correspondence to the QAO.

7.3 Field Audits

Periodic audits may be conducted of field sampling procedures to ensure adherence to the CCLEAN QAPP. However, before any field sampling is conducted, the Project Manager for each subcontractor will verify that proper equipment is available for all field personnel. This includes sampling equipment, safety equipment, and field measurement equipment (if appropriate). It

will also be verified that all personnel involved in field activities have received sufficient training and are able to properly use the equipment and follow procedures. The Project Manager or Field Program Manager may also verify the application of procedures and equipment periodically. If the Project Manager or Field Program Manager finds any deficiencies, corrective actions will be put in place and reported, and follow-on inspections will be performed to ensure the deficiencies have been addressed. Information from field audits will be included in the annual QA Audit report submitted to the CCLEAN Steering Committee and the Regional Board by November 31 each year.

8 Health and Safety Procedures

All field staff will be expected to abide by their employer's (i.e., the field contractor's) health and safety program (HSP) and the local jurisdictions' rules and criteria.

9 Data Evaluation and Reporting

9.1 Data Verification

Data verification is the process of evaluating the completeness, correctness, and conformance / compliance of a specific data set against the method, procedural, or contractual specifications. The QAO will conduct data verification, as described in the QAPP, in order to ensure that it is SWAMP-comparable with respect to completeness, correctness, and conformance with minimum requirements.

9.2 CCLEAN Reports

CCLEAN requires an Annual Report (**Table 17**) to be submitted to the Central Coast Regional Water Quality Control Board by March 31 each year. The report includes the following items:

- a description of the study design,
- locations of sampling sites,
- a summary of sampling methods,
- highlights of temporal trends and spatial variation in data,
- comparison to water quality objectives and other applicable standards or alert levels, as described in Section 7
- synthesis of results relating data from different measurements to each other, and
- any recommended program changes.

Data are uploaded to CEDEN for availability by Water Board personnel and the interested public.

The goal of the report is to provide a summary of results that addresses each program question and is understandable to informed lay people. Core management and scientific questions are stated first, followed by a concise summary of the major findings and the degree of confidence associated with these. Figures and maps are the main mode of presenting findings and a single tabular summary of sampling effort is included. Statements about patterns in the monitoring

results are accompanied by interpretations that discuss the implications of the results. More detailed data summaries, information on sampling and analysis methods, and discussion of QA/QC issues are presented in appendices.

Table 17. CCLEAN Reporting Schedule.

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Draft CCLEAN Annual Report	Annually	Jan 31	Program Director	CCLEAN Steering Committee and Water Board
Final CCLEAN Annual Report	Annually	Mar 31	Program Director	Water Board
CCLEAN electronic data	Annually	Jan 31	Program Director	CCLEAN Steering Committee
CCLEAN QAPP Audit	Annually	Dec 31	Program Director	CCLEAN Steering Committee
CCLEAN Monitoring Plan	Annually	July 1	Program Director	CCLEAN Steering Committee and Water Board
Draft revisions to CCLEAN QAPP	As necessary	TBD	Program Director	CCLEAN Steering Committee and Water Board
Final revisions to CCLEAN QAPP	As necessary	TBD	Program Director	Water Board

9.3 CCLEAN QAPP

As the CCLEAN program or SWAMP programmatic documents are revised, the CCLEAN QAPP will be updated accordingly. Draft and final QAPP documents are submitted on the schedule shown in Table 17.

10 Adaptive Management

The CCLEAN Program and decision-making process includes a commitment to adaptive management. This approach ensures the flexibility needed to add or delete program elements in response to previous findings or emerging concerns to water quality managers. For example, the CCLEAN Steering Committee implemented measurements of polybrominated diphenyl ethers (PBDEs) in 2006, funded a study of reproduction disrupting activity in wastewater in 2009, screening for pyrethroids and fipronils in 2015, conducted a pilot study of microplastics in 2019, and concurrently reduced resources allocated to riverine monitoring.

11 References

American Public Health Association. 1970. Recommended Procedures for the Examination of Sea Water and Shellfish, Fourth Edition. American Public health Association, 1015 18th Street N.W., Washington, D.C. 20036.

Applied Marine Sciences (AMS). 2023. CCLEAN Sediment Sampling and Analysis Plan 2023. Prepared by Applied Marine Sciences, Inc. for the Central Coast Long-term Environmental Assessment Network. October 2023.

Armstrong, F.A.J., Sterns, C.R., and Strickland, J.D.H. (1967) The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Research 14(3): 381-389.

CCLEAN 2024. Quality Assurance Project Plan for Central Coast Long-term Environmental Assessment Network Program, version 9. Prepared by Applied Marine Sciences, Inc. for the Central Coast Long-term Environmental Assessment Network. May 2024.

Department of Fish and Game (DFG). (2001). Sampling and Processing Trace Metal and Synthetic Organic Samples of Marine Mussels, Freshwater Clams, Marine Crabs, Marine and Freshwater Fish and Sediments (DFG SOP 102), July 21, 2001

Eittreim SL, Xu JP, Noble M, Edwards BD (2002) Towards a sediment budget for the Santa Cruz shelf. Marine Geology [Mar. Geol.]. 181: 1-3

Grasshoff, K., Ehrhardt, M., and Kremling, K. Methods of Seawater Analysis, second revised and extended edition, 1983.

Kerouel, R. and Aminot, A. (1997) Fluorometric determination of ammonia in sea and estuarine waters by direct segmented flow analysis. Marine Chemistry 57(3-4): 265-275.

Lauenstein, G.G. and A.Y. Cantillo. 1993. NOAA Technical Memorandum NOS ORCA 71. National Status and Trends Program for Marine Environmental Quality. Silver Spring, Maryland.

Murphy, J. and Riley, I.P. (1962) A modified single solution method for the determination of phosphate in natural waters. Analytical Chimica Acta 27: 31-36.

SWAMP, 2017. SWAMP Quality Assurance Project Plan. Prepared for the California State Water Quality Control Board. May 2017.

State Water Resources Control Board. (2019). California Ocean Plan. http://www.waterboards.ca.gov