Machado Lake Nutrient TMDL
Monitoring and Reporting Program Plan

Prepared for:

City of Carson

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1. Background

Machado Lake was designated as an impaired water body on the 1998, 2002, 2006, and 2010 Federal Clean Water Act (CWA) Section 303(d) lists due to eutrophic conditions, algae, ammonia, and odors. Excessive loadings of nutrients, in particular nitrogen (including ammonia) and phosphorus, cause eutrophic effects, including algae and odors, which impair the beneficial uses of Machado Lake. The nutrient enrichment results in high algal productivity and algal blooms have been observed in the lake during summer months[1]. In addition, high nutrient concentrations contribute to excessive and nuisance macrophyte growth. Algae respiration and decay depletes oxygen from the water column creating an adverse aquatic environment. The CWA requires that a Total Maximum Daily Load (TMDL) then be developed to restore the impaired water bodies to their full beneficial uses. The beneficial uses of Machado Lake that are impaired as a result of nutrients include:

- Recreation (REC 1 and REC 2);
- Aquatic life (WARM, WILD, RARE, and WET); and
- Water supply (MUN).

On May 1, 2008, the Los Angeles Regional Water Quality Control Board (Regional Board) adopted Resolution No. R08-006 amending the *Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) to incorporate a Nutrient TMDL for Machado Lake. The TMDL is designed to protect the beneficial uses of Machado Lake and achieve applicable Water Quality Objectives which include narrative objectives for Biostimulatory Substances and Taste and Odor, and numeric objectives for Dissolved Oxygen and Ammonia. The TMDL was adopted by the U.S. Environmental Protection Agency (US EPA) and became effective on March 11, 2009. This TMDL sets forth stringent numerical limits for nitrogen and phosphorus, as well as numerical targets for ammonia, dissolved oxygen, and chlorophyll a which will help assess the overall water quality in the lake.

1.1 Plan Objectives

The purpose of this document is to establish a Monitoring and Reporting Program (MRP) plan to monitor and assess the water quality of discharges exiting the city of Carson. The plan describes the representative monitoring site for the city of Carson drainage system which is situated at the furthest accessible downstream location as it exits the city. This site will be monitored for TMDL compliance as described herein. Results from this monitoring will be beneficial in determining the scope of work needed for the implementation of Best Management Practices (BMPs) to be used in order to achieve compliance with the Water Quality Objectives set forth in the Machado Lake Nutrient TMDL.

The objective of this MRP plan is to monitor and implement the TMDL, and assess compliance with the Waste Load Allocations (WLAs). The MRP plan will measure the progress of pollutant load reductions and improvements in water quality as a result of implementation actions. This plan outlines the city of Carson's compliance approach, methodology for conducting sampling and reporting, and quality assurance and quality control procedures.

1.2 TMDL Compliance Approach

The Machado Lake Nutrient TMDL established and assigned dry- and wet-weather interim and final WLAs to urban stormwater dischargers subject to a Municipal Separate Storm Sewer System (MS4) discharge permit. The city of Carson is named in the TMDL as an MS4 Permittee that is responsible for discharges to Machado Lake.

[1] Staff Report for Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL, Attachment A to Resolution No. R08-006, May 1, 2008.

The TMDL outlines three options for compliance. Interim and final WLAs are summarized in Table 1-1 and can be demonstrated through one of the following methodologies:

- Concentration-based WLAs with in-lake monitoring.
- Concentration-based WLAs with monitoring at the end of the city of Carson's drainage system (end-of-pipe).
- Mass-based WLAs with end-of-pipe monitoring.

Table 1-1 Interim and Final Waste Load Allocations

Compliance Date	Interim Total Phosphorus WLAs (mg/L)	Interim Total Nitrogen (TKN + NO3-N + NO2-N) WLAs (mg/L)
March 11, 2009	1.25	3.50
March 11, 2014	1.25	2.45
Sept. 11, 2018 (Final WLAs)	0.1	1.00

The city of Carson has determined that the best option for compliance is concentration-based WLAs with end-of-pipe monitoring. However, the storm drain systems which convey drainage from the city of Carson are intertwined and cross-connected with other upstream jurisdictions. Drainage from these other cities mixes with city of Carson runoff and ultimately discharges to Machado Lake. To demonstrate compliance with the concentration-based WLAs, the city of Carson decided to select one end-of-pipe monitoring location which is representative of the three Machado Lake subwatersheds and has minimal mixing of runoff with other jurisdictions.

Once the MRP is approved by the Regional Board, monitoring in accordance with this plan will continue until the city of Carson has established compliance with final WLAs. Once compliance with final WLAs is established, the results of the MRP plan and other available information may be used to revise the amount of monitoring required to demonstrate continued TMDL compliance under a revised MRP plan or other Regional Board order.

1.3 Geography

The city of Carson is located in southern Los Angeles County, surrounded by the cities of Compton, Long Beach, and Los Angeles, and Los Angeles County unincorporated areas and communities. While the city of Carson is 18.9 square miles in size, only a small portion of the southwestern quadrant is tributary to the Wilmington Drain and Machado Lake. Drainage from the city's tributary areas drains in a southwesterly direction through the Panama Avenue Drain (Project No. 690), Frampton Avenue Drain (Project No. 510), County Project No. 1201, and eventually the Wilmington Drain.

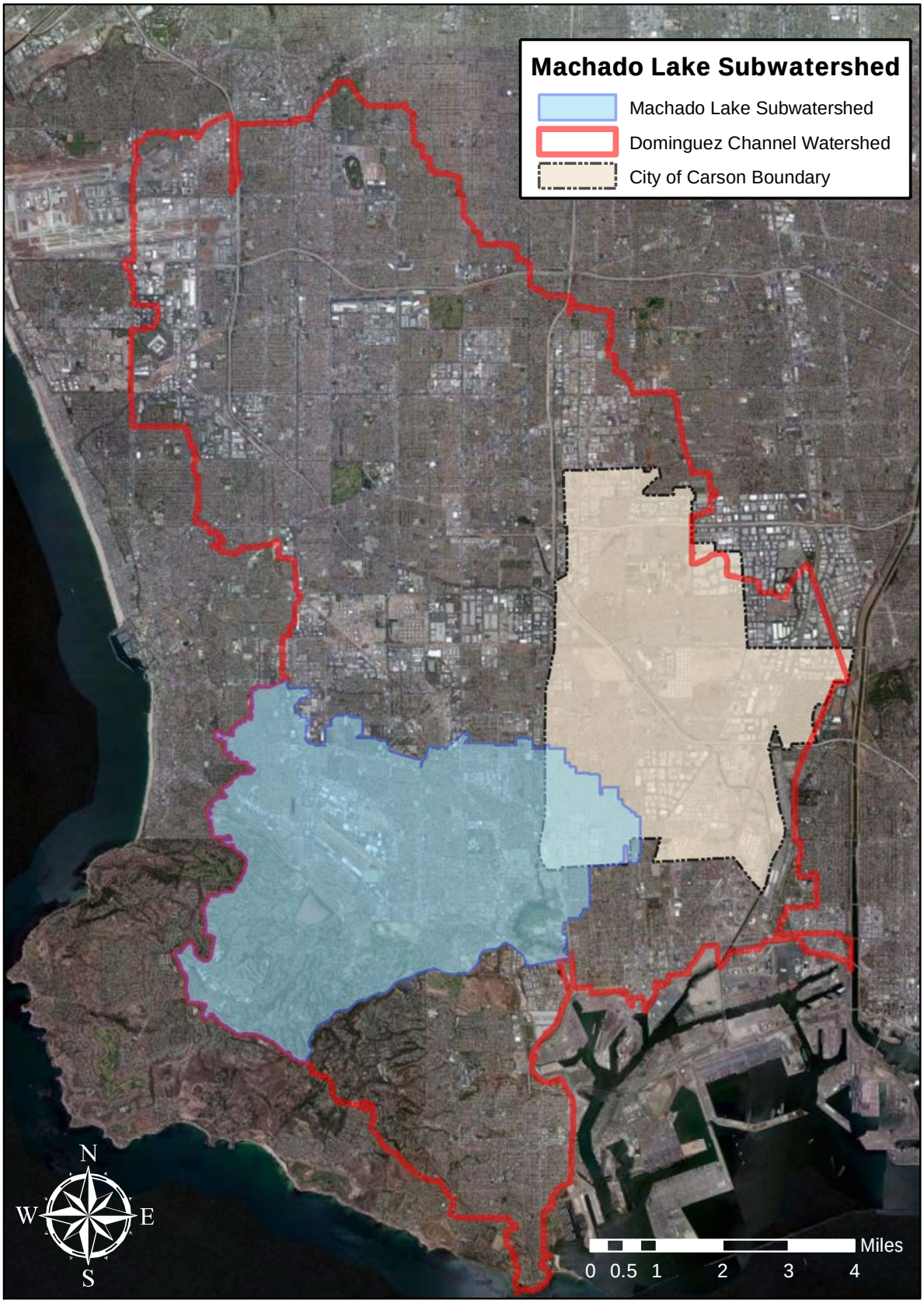

Figure 1-1 Machado Lake Subwatershed Map

1.4 Topography

The city of Carson's three Machado Lake subwatersheds have a relatively flat relief towards the southwest. These drainage areas are heavily developed and urbanized with non-native vegetation surrounding most building structures. Slopes within the three drainage areas average less than one-half percent.

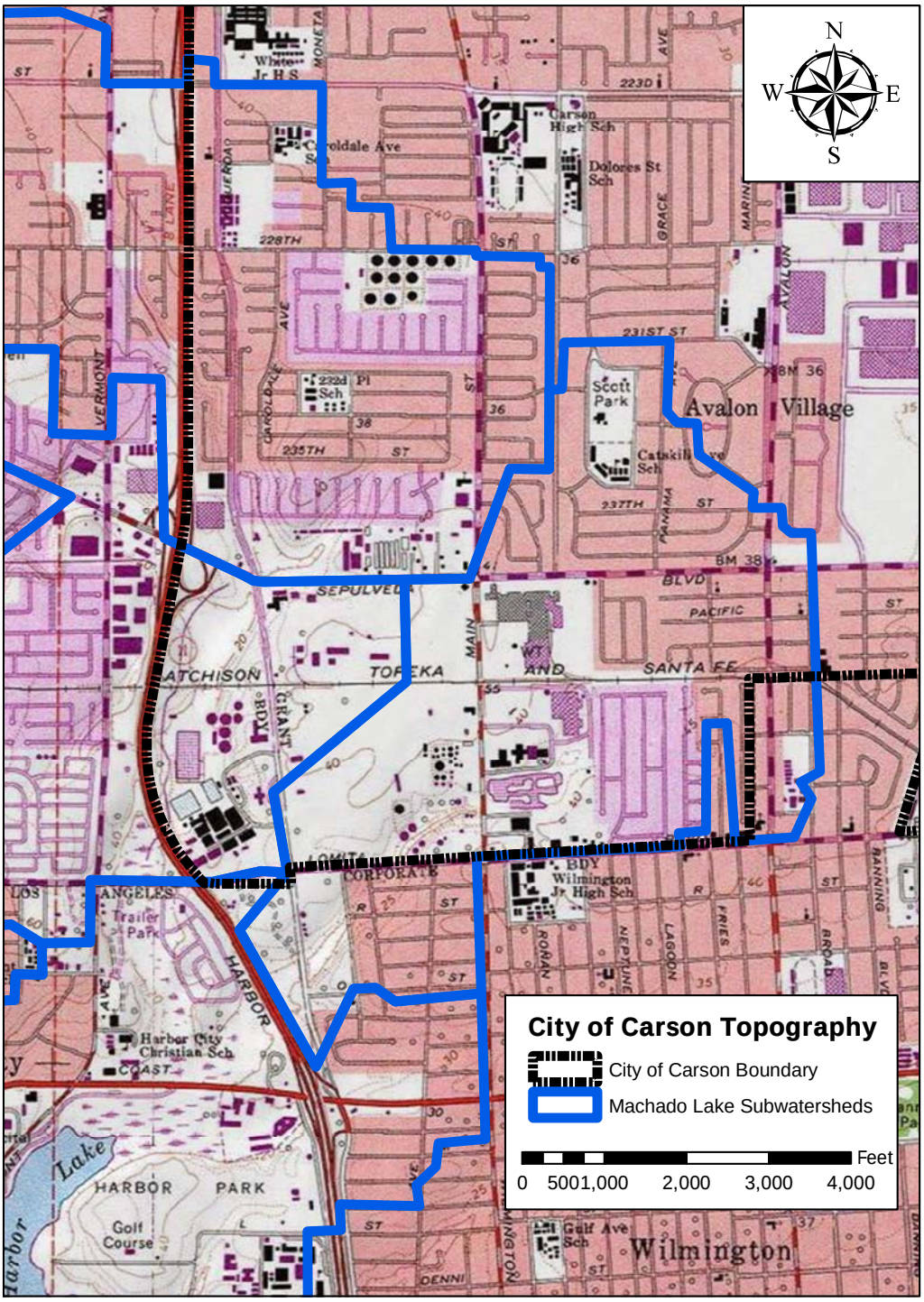

Figure 1-2 Topography Map

1.5 Tributary Drainage Areas

The city's tributary drainage area is approximately 1.9 square miles and can be divided into three distinct subwatersheds. Drainage Area No. 1 (DA 1) consists of mixed runoff from the cities of Carson, Los Angeles, and Torrance, unincorporated County areas, and California Department of Transportation (Caltrans) right-of-way. Discharges from Drainage Area No. 2 (DA 2) are from the cities of Carson, Lomita, Los Angeles, and Torrance, unincorporated County, and Caltrans. All city of Carson runoff within this area is from the Sanitation Districts of Los Angeles County Joint Water Pollution Control Plant (JWPCP) facility. Runoff from Drainage Area No. 3 (DA 3) is almost exclusively from the city of Carson with the exception of a small area in the upper subwatershed, approximately 34.56 acres, and another small downstream area both from the city of Los Angeles. This drainage area best represents the discharges likely to emanate from the city's different land use types. The reason for this is that DA 3 is predominantly from the city of Carson and the composition of land use types within this drainage area are similar to those of DA 1 and 2 combined. Table 1-2 shows the city's size in relation to the overall size of each drainage area.

Table 1-2 Subwatershed Drainage Area Sizes

Drainage Area Composition	DA 1 (Acres)	DA 2 (Acres)	DA 3 (Acres)
City of Carson	468	192	547
Others Jurisdictions	644	820	143
Total Area	1,112	1,012	690
Carson as a Percentage of Total Area	**42.1%**	**19.0%**	**79.3%**

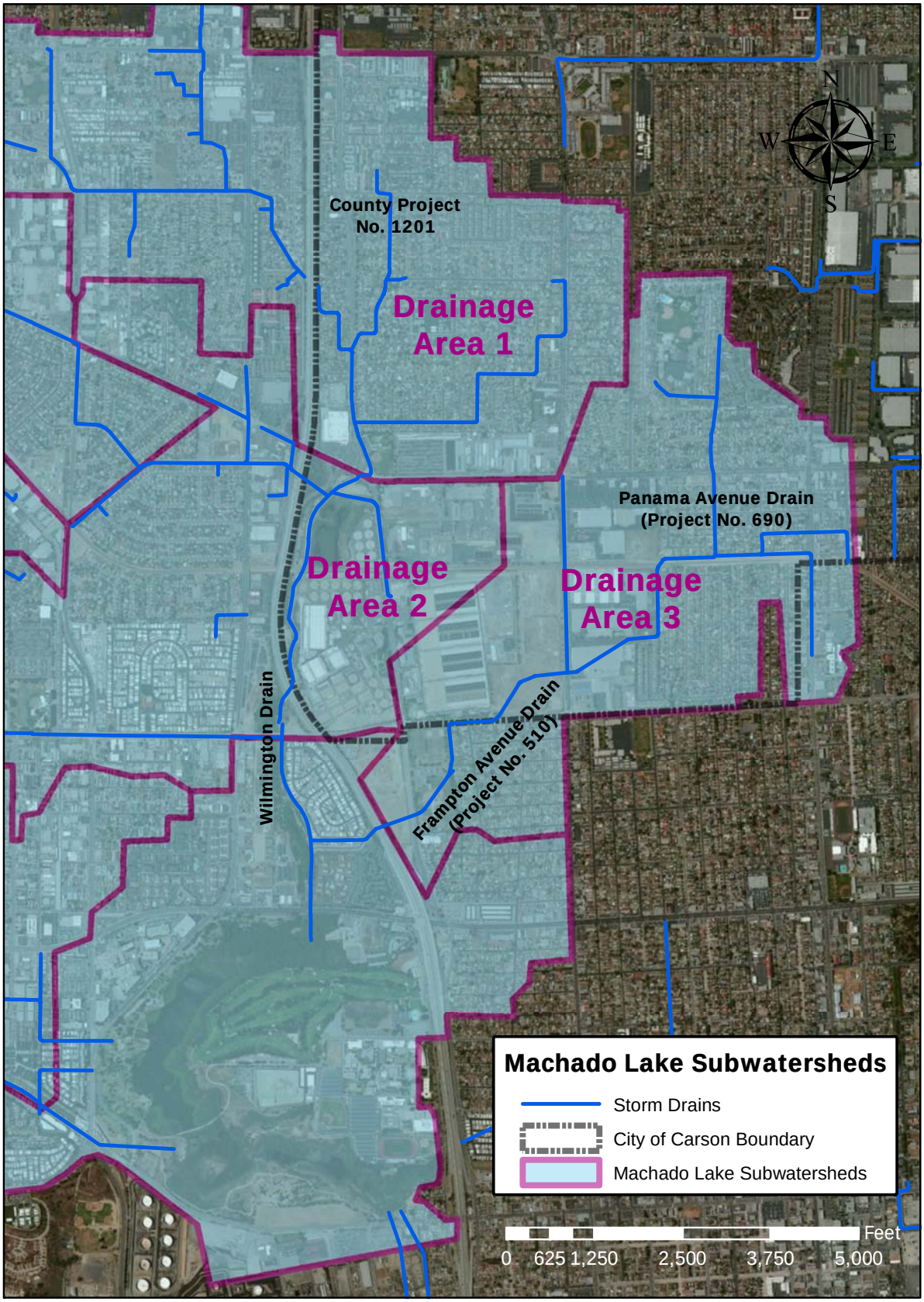

Figure 1-3 Machado Lake Subwatersheds – City of Carson Drainage Areas

1.6 Land Use

The city of Carson provides a sustainable balance of land uses, including residential, commercial, industrial, educational, recreational, and open space. Table 1-3 provides a breakdown of land use designations[2] within each of the Machado Lake subwatershed drainage areas within the city of Carson.

Table 1-3 Subwatershed Drainage Area Land Use Designations

Land Use Designations	DA 1 (Acres)	DA 2 (Acres)	DA 3 (Acres)	Total Area (Acres)	Percentage of Drainage Area (%)
Commercial Storage	3.58	-	-	3.58	0.30
Developed Local Parks and Recreation	5.87	-	12.79	18.66	1.55
Duplexes, Triplexes, and 2- or 3-Unit Condominiums	-	-	28.48	28.48	2.36
Elementary Schools	18.14	-	6.57	24.71	2.05
Freeways and Major Roads	8.12	6.82	-	14.95	1.24
High-Density Single Family Residential	351.12	-	213.62	564.75	46.78
Liquid Waste Disposal Facilities	1.12	136.05	83.37	220.54	18.27
Low- and Medium-Rise Major Office Use	4.92	-	-	4.92	0.41
Low-Rise Apartments, Condominiums, and Townhomes	16.00	-	21.41	37.41	3.10
Manufacturing, Assembly, and Industrial Services	0.33	7.93	32.28	40.55	3.36
Mixed Residential	-	-	18.64	18.64	1.54
Modern Strip Development	8.35	-	19.26	27.61	2.29
Natural Gas and Petroleum Facilities	-	-	44.46	44.46	3.68
Nurseries	35.54	2.12	0.15	37.82	3.13
Older Strip Development	-	-	0.18	0.18	0.01
Open Storage	-	2.71	0.41	3.12	0.26
Religious Facilities	-	-	3.61	3.61	0.30
Retail Centers	10.97	-	36.55	47.52	3.94
Vacant Undifferentiated	3.57	26.75	1.72	32.04	2.65
Water Storage Facilities	-	9.76	-	9.76	0.81
Wholesaling and Warehousing	-	-	23.93	23.93	1.98
TOTALS	**468**	**192**	**547**	**1,207.24**	**100.00**

The city of Carson drainage area tributary to Machado Lake is dominated by the low, medium, and high density residential land uses. These land use designations encompass approximately 54% of the entire area. The next most dominant land use type is Liquid Waste Disposal Facilities making up 18% of the tributary drainage area. The Liquid Waste Disposal Facilities designation covers most of the Sanitation Districts of Los Angeles County JWPCP facility.

Figure 1-4 illustrates the land use designations within each of the three drainage areas tributary to Machado Lake.

[2] Los Angeles County Department of Regional Planning, Land Use Data 2006.

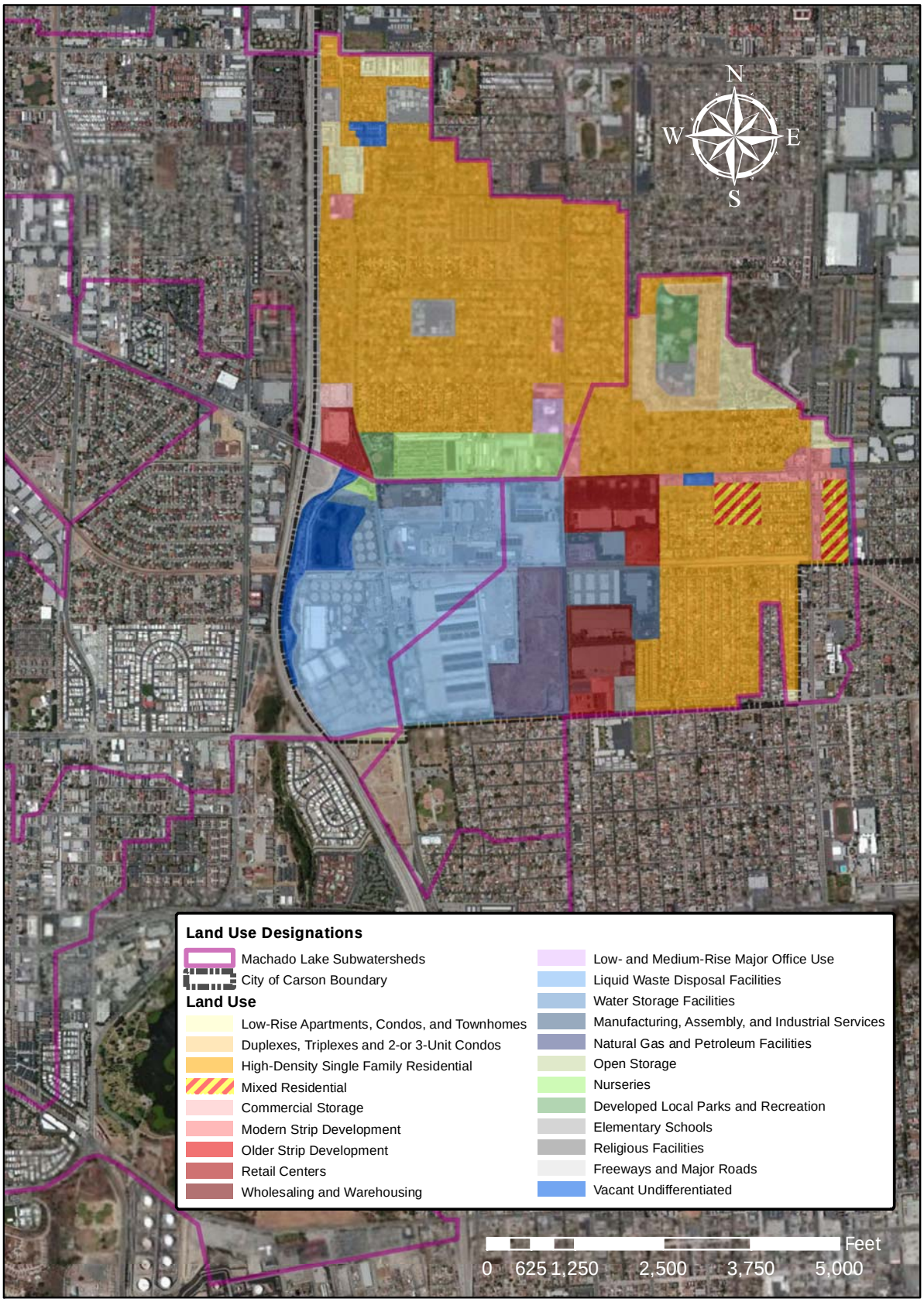

Figure 1-4 Land Use Designations within City of Carson Drainage Areas

2. Constituents to be Monitored

Compliance with the Machado Lake Nutrient TMDL will be shown through concentration-based monitoring. The water quality constituents to be analyzed and the respective analytical methods are shown in Table 2-1. A laboratory certified through the State of California's Public Health Environmental Laboratory Accreditation Program (ELAP) will provide the analytical services for this MRP plan.

Table 2-1 Water Quality Constituents to be Monitored

Constituent	Matrix	Method
Nutrients		
Total Kjeldahl Nitrogen (TKN)	Water	EPA 351.3
Total Phosphorus	Water	EPA 365.2/SM 4500-P E
Nitrate (NO_3-N)	Water	EPA 353.2/SM 4500-NO3-E
Nitrite (NO_2-N)	Water	EPA 353.2/SM 4110-B

3. Sampling Locations

The city of Carson has selected a monitoring site that is representative of the three drainage areas and land uses tributary to Machado Lake. This monitoring site has been selected to ensure that:

- Only drainage tributary from the city of Carson, to the maximum extent possible, is collected and analyzed.
- Samples collected and analyzed are representative of the discharges from the land uses found within the three drainage areas tributary to Machado Lake.
- Monitoring could be conducted in a safe manner considering traffic and access conditions.

In order to establish an appropriate and representative monitoring location, subdrainage areas were delineated based on a desktop examination of Geographic Information System (GIS)-based drainage maps, as-built plans, topographic drainage, maps, and aerial photographs. Several potential monitoring locations were identified based on this desktop analysis. The final monitoring site was selected based on field reconnaissance to identify a representative location that could be safely accessed for monitoring.

The proposed monitoring location directly monitors 547 acres of the city's 1,207 acres that are tributary to Machado Lake. This monitoring station will provide direct monitoring of all the major land uses found within the three drainage areas to accurately characterize the water quality of the city's discharges. The selected monitoring location is in DA 3 which has similar land use designations and ratios to those found in DA 1 and 2 combined (see Section 1.6 for comparison).

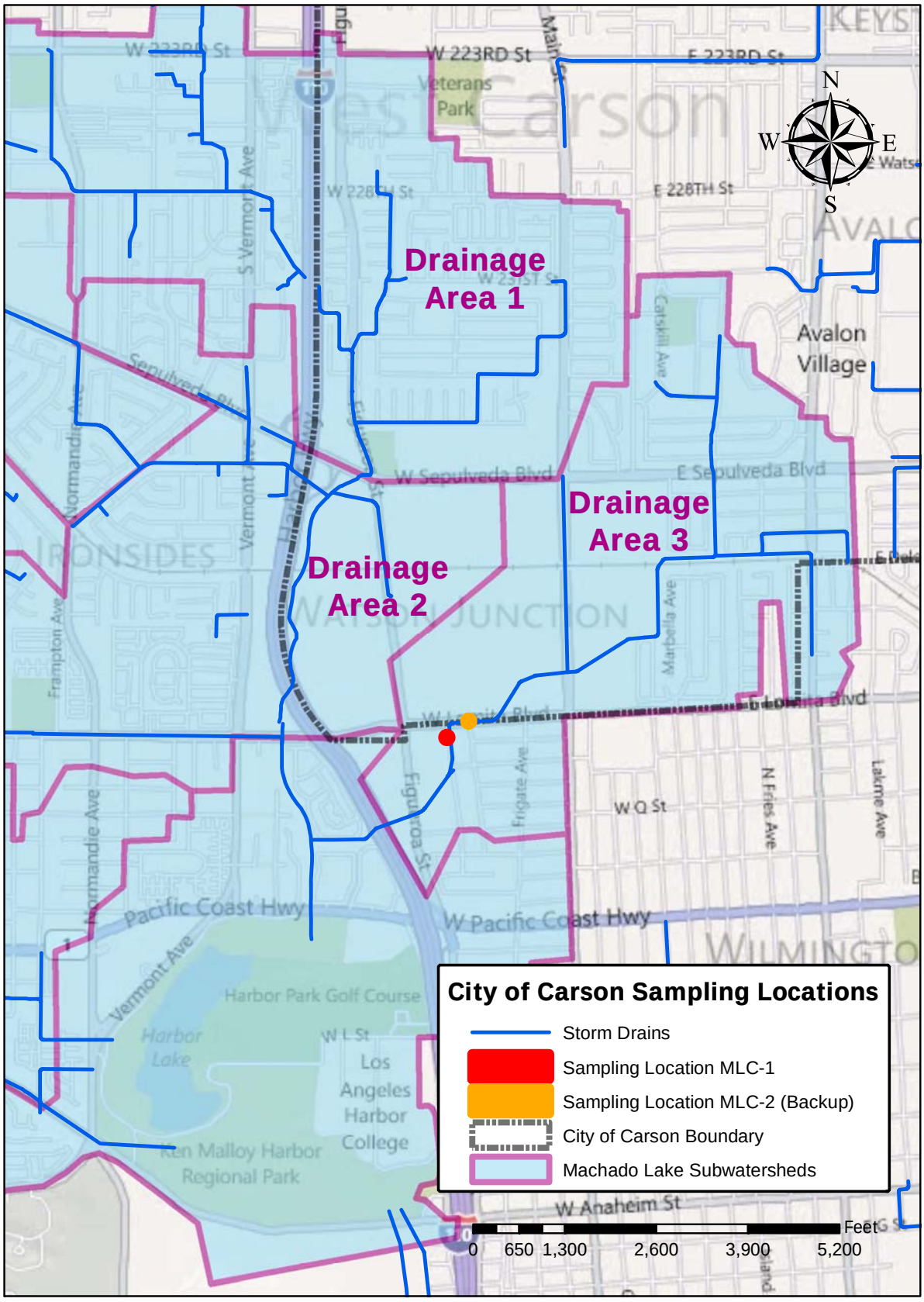

Figure 3-1 Water Quality Monitoring Site Location Map

The following is a description of the selected compliance monitoring location for the city of Carson.

Site ID: MLC-1	**Status:** New	**Location:** LACFCD Manhole
Subwatershed: DA 3	**GPS Coordinates:** 33.79775°, -118.28096°	**Sampling Methodology:** Grab
Comments: The sampling location is a Los Angeles County Flood Control District (LACFCD) manhole for the Frampton Avenue Drain (Project No. 510). The site is located along the western parkway of Eudora Avenue within the city of Los Angeles. This storm drain station does not receive any additional runoff downstream of the city of Carson limits. The typical dry- and wet-weather flow conditions at this site are unknown at this time. The manhole is safely accessible during both dry- and wet-weather conditions.		

As a precaution, a backup monitoring location has been selected in the event that MLC-1 is inaccessible or unsafe.

Site ID: MLC-2	**Status:** New (Backup Location)	**Location:** LACFCD Manhole
Subwatershed: DA 3	**GPS Coordinates:** 33.79843°, -118.28005°	**Sampling Methodology:** Grab
Comments: The backup sampling location is a LACFCD manhole located at the intersection of Lomita Boulevard and Van Tress Avenue. The site is accessible at all times of the day. The typical dry- and wet-weather flow conditions at this site are unknown at this time. The manhole is safely accessible during both dry- and wet-weather conditions, but will require appropriate traffic management controls.		

4. Sampling Methods

4.1 Collection Methods

All samples will be collected using manual grab sampling methods, during dry- and wet-weather events. Samples will be collected by-hand, when possible, or by using an extension pole with a bottle attachment. If necessary, a portable battery-powered peristaltic pump, with properly cleaned tubing, will be used to collect the samples during low-flow conditions, where the extension pole is not effective. All sampling equipment will be properly cleaned prior to each sampling event. When using the extension pole, ultrapure de-ionized water will be used to rinse off any residual site water from the apparatus. If the peristaltic pump is used, a new properly cleaned length of tubing will be used at each sampling location to avoid cross-contamination of the samples.

A two-person team will conduct all sampling events. The sampling team will have access to a cellular phone in order to alert rescue agencies should an accident occur. Sampling will be postponed if the sampling team determines that the conditions are unsafe. Failure to collect a sample due to safety

concerns or technical issues will be promptly reported to the Project Manager, who will determine if any corrective action is needed and make arrangements to collect a replacement sample, if possible.

4.2 Analytical Methods

Analytical methods are described in the Standard Methods for the Examination of Water and Wastewater and US EPA standard methods. The list of constituents, measurement techniques, method detection limits (MDLs), and reporting limits (RLs) is presented in Table 4-1.

Table 4-1 Laboratory Analytical Methods

Constituent	Analytical Method	Units	MDL	RL
Nutrients (Water)				
Total Kjeldahl Nitrogen	EPA 351.3	mg/L	0.06	0.4
Total Phosphorus	SM 4500-P E	mg/L	0.016	0.05
Nitrate (NO_3-N)	EPA 353.2	mg/L	0.02	0.05
Nitrite (NO_2-N)	EPA 353.2	mg/L	0.005	0.03

The method quality objectives for the monitoring program include accuracy, precision, and completeness. The method quality objectives are described in more detail in the Quality Assurance Project Plan (QAPP).

5. Sampling Frequency

5.1 Dry- and Wet-Weather Sampling Frequency

Dry-weather grab samples will be collected on a monthly basis, unless a qualifying wet-weather sample is collected first. Samples will be collected from the proposed monitoring site identified in Section 3. Samples will be collected in approved containers using standard sampling methods.

Two annual wet-weather grab samples are also scheduled to be collected. The two wet-weather samples can substitute for two of the monthly dry-weather samples. If a qualifying wet-weather event does not occur or is not anticipated to occur for the month, the city of Carson will collect dry-weather samples.

Table 5-1 Sampling Frequency

Weather Condition	Sampling Frequency
Dry-weather	Monthly
Wet-weather	Two storm events annually[1]

[1] The two annual wet-weather events can be substituted for two of the monthly dry-weather sampling events.

5.2 Wet-Weather Tracking

Weather will be tracked for monitoring purposes between October 1st and May 31st of each year. Throughout the storm season, several sources for weather information will be monitored continuously, such as Internet web pages for the National Weather Service and Automated Local Evaluation in Real Time (ALERT) systems.

5.3 Storm Selection Criteria

The following criteria will be used to determine if mobilization will occur for an impending storm event to collect a wet-weather sample:

- Storms must be forecasted to produce at least 0.10 inches of rain.
- The probability of precipitation occurring must be greater than 60 percent.
- Storm events must be preceded by at least 72 hours of dry conditions (<0.10 inches of precipitation).

6. Sampling Protocol

Sampling procedures will adhere to the guidelines found in the Surface Water Ambient Monitoring Program (SWAMP) water sample collection Standard Operating Procedures (SOP), "Field Collection of Water Samples." This section details the monitoring event preparation, water sample collection procedures, and sample management procedures that will be followed.

6.1 Monitoring Event Preparation

The following are the specific monitoring event preparation protocols that will be followed by the sampling team.

6.1.1 Mobilization and Staffing

Monitoring water quality of dry-and wet-weather discharges requires considerable planning; therefore, it is critical to plan and prepare all possible aspects of the field effort well in advance. A staffing plan designates personnel and equipment required for each facet of monitoring.

Given the samples and precautions that need to be taken during dry- and wet-weather monitoring events, the field crew will consist of a team. The field team will be composed of two team members. The staffing plan will include the following:

- Personnel assigned for each position
- Equipment mobilization
- Communication channels

6.1.2 Personnel

Water quality monitoring tasks require a variety of skills and positions. The required personnel include:

- Sampling Manager
- Field Coordinator
- Field Technicians

Sampling Manager – The Sampling Manager is a technically-skilled, field experienced supervisor and is the most experienced member of the field team. This position requires a thorough understanding of project requirements, sampling procedures, and equipment operations. The Sampling Manager will communicate frequently with the Field Coordinator and also monitor the ability of the field team to safely and effectively complete their shifts. The Sampling Manager will be available to troubleshoot the common problems that could be experienced by the field team.

Field Coordinator – The Field Coordinator is a field person trained in the operation and procedures of dry- and wet-weather water quality monitoring. The Field Coordinator is responsible for directing the procedures at each site visit and ensuring that samples are collected and data is recorded properly. The Field Coordinator will communicate with the Sampling Manager to aid in the determination of task priorities and address any questions that may arise.

Field Technicians – The Field Coordinator will usually have one or two field technicians assisting them. Field technicians are field personnel trained in water sample collection and health and safety issues.

6.1.3 Field Equipment Preparation

Sampling personnel will provide all necessary equipment to be able to sample in various environmental and physical conditions. The necessary equipment will be loaded into the appropriate vehicle before mobilizing to the monitoring site. A list of necessary equipment is presented below.

Table 6-1 Equipment and Mobilization List

Equipment List	Mobilization List
First aid kit	Manhole hook/pick
Flashlights and spare batteries	Log books
Maps	Job Site Health Analysis
Umbrella	Tailgate Safety Meeting forms
Spare sample labels	Paper towels
Pencils and indelible markers	Sample labels
Diagonal cutter	Sample control paperwork (e.g., COC)
Electrical tape	Extra fine indelible markers
Duct tape	Grab sample bottles
Cable ties (assorted sizes)	Coolers and ice
Utility knife	Deionized water squirt bottles
Ziploc baggies (assorted sizes)	Grab pole, rope, and duct tape
Nitrile gloves	Battery-powered peristaltic pump
Keys (if necessary)	Laboratory-provided blank water
	Cellular phone
	Digital camera
	Necessary safety and rain gear
	Personal extra change of clothes
	Traffic cones and signs
	Copy of signed authorization letter allowing access/encroachment/unrestricted parking during sampling

6.1.4 Bottle and Equipment Cleaning

Sampling equipment will go through a rigorous decontamination procedure prior to its use. The following procedures will be used:

Bottles

1. Rinse bottle with warm tap water three times as soon as possible after emptying sample.
2. Soak the bottle in a 2-percent solution of detergent (e.g., Contrad) for 48 hours; use a clean plastic brush to scrub the sides of the container.
3. Rinse three times with tap water.

4. Rinse five times with Milli-Q or equivalent water (passed through two filters after deionized system), rotating the bottle to ensure contact with the entire inside surface.
5. Rinse three times with hexane, rotating the bottle to ensure contact with the entire inside surface (use 20 mL per rinse).
6. Rinse six times with Milli-Q water.
7. Rinse three times with 2N nitric acid (1-L per bottle, per rinse) rotating the bottle to ensure contact with the entire inside surface.
8. Rinse six times with Milli-Q water.
9. Cap the bottle with Teflon stopper cleaned as specified below.

Teflon and Peristaltic Pump Hoses, Lids, Stoppers, and Strainers

1. Make up a 2-percent solution of disinfectant soap (Micro) in warm tap water.
2. Rinse tubing three times with the 2-percent Micro solution; wash lids and strainers with Micro solution and plastic brush.
3. Rinse three times with tap water.
4. Rinse three times with Milli-Q water.
5. Rinse three times with a 2N nitric acid solution.
6. Soak 24 hours in a 2N nitric acid solution.
7. Rinse three times with Milli-Q water.
8. Seal the tubing on both ends with clean latex material.
9. Individually double-bag tubing in new polyethylene bags properly labeled. Double-bag lids and strainers individually in Ziploc bags.

6.1.5 Communication Channels

Communication channels must be established for personnel to contact each other before and during the event. The project field notebook will include phone lists with home, work, and cellular numbers of the field team to aid in communication and work numbers for primary laboratory contacts and city of Carson personnel. Cellular telephone communication links to field teams are essential for efficient monitoring because the Program Manager and Sampling Manager will need to track the location and workload of each field team and direct them to priority tasks.

6.1.6 Laboratory Coordination

The Field Coordinator will place a sample bottle order with the analytical laboratory before all monitoring activities. Immediately following each monitoring event, the bottle inventory will be checked and additional bottles ordered as needed. The bottles must be the proper size and material, and contain preservatives as appropriate for the specified laboratory analytical methods. The laboratory order should also include blank water for the collection of required field blank samples.

6.1.7 Sample Container Preparation

All glassware, sample bottles, and collection equipment will be inspected prior to their use. Some sampling containers and caps will be obtained from the participating laboratory. The Sampling Manager and Field Coordinator will be in charge of ordering sampling containers. All ordered supplies will be examined for damage as they are received. The laboratory maintains logbooks for all consumables that are checked against all materials received. Bottles and caps will be inspected for damage prior to sampling, and only sound bottles with intact threads will be used. The container caps will be tested for tightness prior to the transport of samples.

The Sampling Manager and Field Coordinator will make sure sufficient field supplies are on hand prior to the start of sampling.

Table 6-2 Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies/Consumables	Inspection/Testing Specifications	Acceptance Criteria	Frequency
Pre-Cleaned Sample Bottles	Open bottle	Lids screwed on bottles	100%
Laboratory Glassware	Dirty	Clean	100%
Lab Solvents and Acids	Leaks	No cracks or chips	Prior to use
19-Liter Glass	Laboratory blanked	Pass blanking analysis	New bottles each monitoring event
1-Gallon Glass	If not certified pre-cleaned then laboratory blanked	Pass blanking analysis	New bottles each monitoring event
125-Milliliter Plastic	Laboratory sterilized	Lids screwed on containers	New bottles each monitoring event
125-Milliliter Glass Container	Laboratory cleaned and blanked	Lids screwed on containers	New bottles each monitoring event
Grab Bags	Dirty, open	Sealed bags	New bottles each monitoring event
10-Liter HDPE Cubitainers	Laboratory cleaned and blanked	Lids screwed on containers	New bottles each monitoring event
Silicone Tubing	Laboratory cleaned and blanked	Pass blanking analysis	New tubing at start of program
Teflon Tubing	Laboratory cleaned and blanked	Pass blanking analysis	New tubing at start of program
Gloves	New box	New box	Monthly

6.2 Water Sample Collection Procedures

Water sample collection procedures will adhere to the guidelines found in the SWAMP SOP, "Field Collection of Water Samples." Grab samples will be collected with a peristaltic pump using Teflon® and silicone tubing or by inserting a 1-gallon glass sample container under or down current of the discharge, with the container opening facing upstream. Depending on flow conditions, sampling may require the use of grab poles and buckets to collect grab samples. Grab samples will be collected from the horizontal and vertical center of the storm drain.

6.2.1 Field Conditions Data Log Sheet

When the sampling team first arrives at the monitoring site, site conditions and other general observations must be accurately recorded on the Field Conditions Data Log Sheet. A sample of this form is included in Appendix A. The following general information should be entered during each dry- and wet-weather monitoring site visit:

- Sampling site ID
- Date
- Time
- Monitoring Program
- Field team

- Conveyance type
- Weather conditions
- Air temperature
- Runoff characteristics
- Appearance and odor of the water
- Flow estimations
- Equipment condition
- Miscellaneous comments

6.2.2 Clean Sample and Handling Equipment

During sampling operations, extreme care must be taken to minimize exposure of the sample and sample collection equipment to human, atmospheric, and other sources of contamination. This section provides clean sample and equipment handling procedures to be used when samples are collected.

Clean sampling techniques typically require a two-person sampling team. Upon arrival at the sampling site, one member of the sampling team is designated as "dirty hands" and the second member is designated as "clean hands". Operations involving contact with the sample bottle, sample bottle lid, sample suction tubing, and the transfer of the sample from the sample collection system, if the sample is not directly collected in the bottle, to the sample bottle are handled by "clean hands" wearing clean, powder-free Nitrile gloves. "Dirty hands," also wearing clean, powder-free Nitrile gloves, is responsible for preparation of the sampler, except the sample container itself, operation of any machinery, and for all other activities that do not involve handling items that have direct contact with the sample. "Clean hands" will change into clean gloves as frequently as required to ensure that the gloved hands contacting the sample container, container lid, and laboratory cleaned sampling equipment have not contacted any source of potential contamination.

Although the duties of "clean hands" and "dirty hands" would appear to be a logical separation of responsibilities, in fact, the completion of the entire protocol may require a good deal of coordination and practice. For example, "dirty hands" must open the box or ice chest containing the sample bottle and unzip the outer bag; "clean hands" must reach into the outer bag, open the inner bag, remove the bottle, collect the sample, replace the bottle lid, put the bottle back into the inner bag, and zip the inner bag. "Dirty hands" must close the outer bag and place the double-bagged sample in an ice-filled ice chest. It is recommended that a third sampling team member be available to direct the team, review the monitoring plan, and complete the necessary sample documentation (e.g., sample location, time, sample number, weather conditions, etc.). If a third sampling team member is not available, "dirty hands" must perform the sample documentation activities.

6.2.3 Subsurface Storm Drain Sampling Procedures

Upon arrival at the monitoring site, the sampling team will inspect the location for general safety. It is important to be aware of the surroundings when working in a street or other right-of-way and it is imperative to place safety cones so that traffic is aware of the situation.

Subsurface storm drain sampling involving manholes can be more involved than open channel sampling and may be inherently more dangerous. These types of areas may be considered confined entry spaces requiring compliance with Occupational Safety and Health Administration (OSHA) regulations. However, the proposed monitoring site will not require entry into a manhole.

A designated sampling apparatus must always be used to fill a sample bottle containing preservative. It is important that the sample bottles do not overflow. If a sample bottle containing preservative

overflows, it must be discarded and a new sample must be taken using a new sample bottle. Listed below are the steps to be taken during subsurface storm drain sampling:

- An ice chest with sufficient ice to properly store any samples will be utilized;
- The required OSHA safety checks and preparations for the removal of a manhole cover and entry into a manhole safely will be completed;
- The designated sampling apparatus labeled with the appropriate site number will be used;
- The sampling apparatus for each site will be acclimated by rinsing it out with water from flow in the drain three (3) times;
- The grab sample will be taken from the horizontal and vertical center of the storm drain (if it is safe to do so);
- The bottom sediments, if there are any, in the drain will not be disturbed so as to avoid contaminating the sample;
- The sampling apparatus will be held so the opening faces upstream with the sampling team member also facing upstream;
- The inside of the sampling apparatus will not be touched in order to prevent contamination;
- The sample water from the sampling apparatus will be transferred into the proper sample bottles without overflowing them;
- The sample bottles labeled with the appropriate site number will be placed in the cooler standing straight up surrounded and supported by ice;
- All sampling team members that had custody of any samples will sign the Chain-of-Custody form;
- The Chain-of-Custody form will be placed into a large watertight Ziploc bag and placed inside the cooler with its corresponding samples;
- The cooler will be secured with packing tape and transported to the laboratory within the designated method holding times; and
- Upon the laboratory receiving custody of the samples, the laboratory's representative will sign the Chain-of-Custody form.

6.2.4 No Sample Taken Procedures

There may be circumstances that would cause the monitoring site to not be sampled. These circumstances may involve:

- Lack of flow or insufficient flow;
- Site inaccessibility; and
- Site safety concerns.

6.2.4.1 Low Flow Conditions

Sampling will be attempted even in extreme low flow conditions. If a sample cannot be taken due to insufficient or a lack of flow, a separate data sheet will be completed to explain why no sample was taken.

6.2.4.2 Site Inaccessibility Due to Storm Event

If the monitoring site becomes inaccessible due to a storm event in which it would be dangerous to approach the storm drain manhole; the sampling team will delay sampling for 24 to 48 hours after the storm event. However, if an alternative monitoring site is in close proximity and provides a sample which is representative of the original monitoring site, then sampling will occur on schedule at the alternative monitoring site.

6.2.4.3 Site Inaccessibility Due to Temporary Physical Obstruction or Condition

If the monitoring site is temporarily or permanently blocked by a physical obstruction, such as downed trees or a vehicle, the sampling team will attempt to sample at the backup location or move immediately upstream or downstream from the monitoring site and conduct sampling there. If there still is no suitable access, the sampling team will determine the possibility of sampling further away from the original monitoring site.

6.3 Sample Management

6.3.1 Sample Handling and Custody

The laboratory will provide appropriate sample containers according to Table 6-3. All samples will be pre-labeled with the project name, site ID, sample type, bottle number, sampler name, preservative, and analysis. All samples bottles will also be pre-labeled with a unique Sample ID to track the sample throughout its analyses. At the time of sample collection, the sample labels will be completed in the field with the date and time. The Sample IDs will also be entered directly onto the Field Conditions Data Log Sheet and Chain-of-Custody (COC) form. The COC form will accompany the collection of all samples.

The following sample handling protocols will be followed when collecting samples to minimize the possibility of contamination:

- Previously unused sample bottles will be employed. Sample bottles and bottle caps will be protected from contact with solvents, dust, or other contaminants during storage and bottle handing.

- The grab sampler will make an effort, within reason, to prevent large gravel and uncharacteristic floating debris from entering the sample containers. The sampler will also make an effort to not stir up sediments at the bottom of the storm drain.

- The inside of the sampling container will not be touched to the maximum extent practicable during preparation and sampling activities.

- Vehicle engines will be turned off during sampling activities to minimize exposure of samples to exhaust fumes.

- All samples will be collected in accordance with “clean sampling” techniques.

- Manual water grab samples will be collected by inserting the transfer container under or down current of the direction of flow, with the container opening facing upstream.

- Once sample containers are filled, they will be promptly placed on ice, in a clean cooler (target temperature 6 degrees Celsius), in the dark and transported to the laboratory for processing to meet holding times. All necessary pre-processing for analysis, such as filtration and acidification, will take place in the laboratory by certified personnel.

- After the field crew collects and delivers the samples to the laboratory, the laboratory will conduct the analysis within the holding times listed in Table 6-3. These field and laboratory activities will be coordinated to make sure all samples are handled within the proper holding time.

After the laboratory receives the water samples, the certified laboratory technicians will dispense the sample contents into containers that contain the required volume specified in Table 6-3. The laboratory will preserve the water samples using the appropriate preservative and the laboratory will conduct the analysis within the maximum holding time limits.

Table 6-3 Sample Handling and Custody

Constituent	Container Type	Minimum Sample Volume	Preservation	Holding Time
Nutrients (Water Analysis)				
Total Kjeldahl Nitrogen	Polyethylene	500 mL	6°C preserved in the lab wit H_2SO_4	48 Hours
Total Phosphorus	Polyethylene	500 mL	6°C preserved in the lab wit H_2SO_4	28 Days
Nitrate (NO_3-N)	Polyethylene	500 mL	6°C	48 Hours
Nitrite (NO_2-N)	Polyethylene	500 mL	6°C	48 Hours

6.3.2 Sample Bottle Labeling

Water quality sample bottles will be pre-labeled, to the extent possible, before each monitoring event. Pre-labeling bottles simplifies field activities and leaves only date, time, Sample ID, and sampling personnel names to be filled out in the field. Each sample collected will be labeled with the following information:

- Project name
- Sample location/ID
- Event number
- Date and time
- Sample matrix (stormwater)
- Sample type (dry-weather, wet-weather, etc.)
- Bottle __ of __ (for multi-bottle samples)
- Collected by
- Preservative
- Analysis

Field samples, field blanks, and field duplicate samples will be labeled, recorded on the COC form, and then transported to the analytical laboratory.

6.3.3 Chain-of-Custody Procedures

The laboratory will supply the Chain-of-Custody (COC) forms that will be utilized by the sampling team. COC procedures will be used for all samples throughout the collection, transport, and analytical process to ensure the most accurate results. COCs will be pre-printed along with the bottle labels and will contain the same data as the labels. The COCs will be completed in the field with dates, times, and sample team names, and will be cross-checked with the bottles to make sure proper samples have been collected. Documentation of sample handling and custody will include the following:

- Sample identification;
- Type of sample;
- Sample collection date and time;
- Any special notations on sample characteristics or analysis;
- Analyses to be performed;

- Initials of the sampling team member that collected the sample; and
- Date the sample was delivered to/sent to the laboratory.

The COC forms for the samples will be transported with the samples to the analytical laboratory. Sampled water will be kept properly chilled and transferred to an analytical laboratory within holding times. When custody of the samples is transferred to the laboratory, the COC will be signed and dated, and a PDF copy will be sent from the laboratory. An example of a COC form is included in Appendix B. The COCs will be reviewed by personnel at the receiving laboratory to make sure no samples have been lost in transport. The laboratory will also verify that each sample has been received within holding times. COC records will be included in the final reports prepared by the analytical laboratory and are considered an integral part of the report.

6.3.4 Corrective Action Procedures

Corrective action is taken when an analysis is deemed suspect for some reason. The reasons include exceedances of the relative percent difference (RPD) ranges, spike recoveries, and blanks. The corrective action varies somewhat from analysis to analysis, but typically involves the following:

- Check of procedure
- Review of documents and calculations to identify any possible error
- Error correction
- Re-analysis of the sample extract, if available, to see if results can be improved
- Complete reprocessing and re-analysis of additional sample material, if it is available

Any failures (e.g., instrument failures) that occur during data collection and laboratory analyses will be the responsibility of the field crew or laboratory conducting the work, respectively. In the case of field instruments, problems will be addressed through instrument cleaning, repair, or replacement of parts or the entire instrument, as needed. Field crews will carry basic spare parts and consumables with them, and will have access to spare parts to be stored at the office. Records of all repairs or replacements of field instruments will be maintained. The laboratory has procedures in place to follow when failures occur, and will identify individuals responsible for corrective action and develop appropriate documentation. The Quality Assurance (QA) Officer at the laboratory has procedures in place to follow when failures occur, and will identify individuals responsible for corrective action and develop appropriate documentation. Any corrective actions taken will be documented in the laboratory's hard copy deliverable or in a Corrective Action Plan.

7. Quality Control

This section addresses Quality Assurance/Quality Control (QA/QC) activities associated with both field sampling and laboratory analyses. The field QA/QC samples are used to evaluate potential contamination and sampling errors introduced prior to submittal of the samples to the analytical laboratory. Laboratory QA/QC samples provide information to assess potential laboratory contamination, analytical precision, and accuracy. If any QA/QC standards are not met, the appropriate corrective actions will be taken in accordance with Section 6.3.4 of this document and the laboratory's QA manual.

7.1 Quality Assurance/Quality Control

The main types of field QA/QC samples that will be utilized for this MRP are described below and provided in Table 7-1.

1. **Field Blanks** – Field blanks verify that field conditions, field sampling activities, and air deposition are non-contaminating. Field blanks are submitted blind to the laboratory. Sample

bottles are filled with reagent-grade, analyte-free deionized water in the field during a sampling event.

2. **Equipment Blanks** – Equipment blanks verify that the sampling containers, sampling equipment, and tubing are contaminant free prior to sampling. A representative number of bottles or sections of tubing from each lot is submitted to the laboratory. The laboratory will use reagent-grade, analyte-free deionized water to fill the bottles or rinse through the tubing and then analyze the water. Blank analysis results are evaluated by checking against reporting limit for that analyte. Results obtained should be less than the reporting limit for each analyte. If results are above the reporting limits then the entire lot must be cleaned and re-analyzed.

3. **Field Duplicates** – Field duplicates evaluate sampling error introduced by both field sampling and laboratory analyses. Field duplicates are submitted blind to the laboratory. Procedures for collecting field duplicates should be the same as those used for collecting field samples. Duplicates of manual grab samples will be collected by filling two grab sample containers at the same time, or in rapid sequence.

4. **Matrix Spike and Matrix Spike Duplicates (MS/MSDs)** – Matrix spikes and matrix spike duplicates are used to assess precision and accuracy of the laboratory analytical method. A matrix spike sample is an aliquot of a field sample spiked with a known amount of analyte and analyzed for spike recovery. A matrix spike duplicate is a duplicate aliquot of the matrix spike sample analyzed separately.

5. **Laboratory Replicate/Split** – A laboratory replicate/split entails a duplicate analysis performed on the contents from the same sample container and assesses the repeatability (precision) of the analytical laboratory's results.

The blank samples, duplicate samples, spike samples, and laboratory replicates need not all come from the same monitoring location during a particular sampling event. However, each of these QA/QC analyses will be provided along with the standard analyses if enough sample volume has been collected. The field QA/QC samples for field blanks and field duplicates are submitted blind to the analytical laboratory.

Table 7-1 Sampling (Field) QC

QA/QC Sample Type	Minimum Sampling Frequency	Constituent Class	Acceptance Limits
Field Blank	Every 20 samples collected at a given site, per sampling event.	All	Field blanks shall find no detectable amounts or less than 1/5 of sample amounts. Accuracy at 1 per culture medium or reagent lot.
Equipment Blank	Sample bottles should be blanked at 10% frequency, or per lot.	All	Equipment blank shall be less than the reporting limit for that analyte.
Field Duplicate	Every 10 samples collected at a given site, or per sampling event.	All	The relative percent difference between the primary sample result and the duplicate sample result should meet the objective for precision.
Matrix Spike/Matrix Spike Duplicate (MS/MSDs)	One per batch or per 20 samples (5%), per sampling event.	Table 7-3	The percent recovery should be within the accuracy acceptance limits.
Laboratory Replicate/Split	One per batch or per 20 samples (5%), per sampling event.	Table 7-3	The relative percent difference between the primary sample result and the replicate result should meet the objective for precision.

7.2 Laboratory Quality Assurance/Quality Control

Internal laboratory quality control checks will include the use of laboratory replicates, method blanks, MS/MSDs, laboratory control samples, and standard reference materials. These quality control samples are described below.

Frequency of analysis is provided in Table 7-2. A breakdown of the associated constituents for each QC sample type is provided in Table 7-3 for water samples.

1. **Laboratory Replicate/Split** – A sample is split by the laboratory into two portions and each sample is analyzed. Once the duplicate analyses have been analyzed, the results are evaluated by calculating the RPD between the two sets of results. This serves as a measure of the reproducibility, or precision, of the sample analysis. Typically, duplicate results should fall within an accepted RPD range, depending upon the analysis.

2. **Method Blanks** – A method blank is an analysis of a known clean sample matrix that has been subjected to the same complete analytical procedure as the field sample to determine if potential contamination has been introduced during processing. Blank analysis results are evaluated by checking against reporting limits for that analyte. Results obtained should be less than the reporting limits for each analysis.

3. **Matrix Spike and Matrix Spike Duplicates (MS/MSDs)** – Matrix spikes and matrix spike duplicates (MS/MSDs) involve adding a known amount of the chemical(s) of interest to one of the actual samples being analyzed. One sample is split into three separate portions. One portion is analyzed to determine the concentration of the analyte in question in an un-spiked state. The other two portions are spiked with a known concentration of the analytes of interest. The recovery of the spike, after accounting for the concentration of the analyte in the original sample, is a measure of the accuracy of the analysis. By determining spike duplicate recoveries, another measure of precision is accomplished. An additional precision measure is made by calculating the

RPD of the duplicate spike recoveries. Both the RPD values and spike recoveries are compared against accepted and known method dependent acceptance limits. Analyses outside these limits are subject to corrective action.

4. **Laboratory Control Sample (LCS)** – The laboratory control sample procedure involves spiking known amounts of the analyte of interest into a known, clean, sample matrix to assess the possible matrix effects on spike recoveries. High or low recoveries of the analytes in the matrix spikes may be caused by interferences in the sample. Laboratory control samples assess these possible matrix effects since the LCS is known to be free from interferences.

5. **Standard Reference Material (SRM)** –SRMs may be used in lieu of laboratory control samples. An SRM is a sample containing a known and certified amount of the analyte of interest and is typically analyzed with the analyst not knowing the analyte concentration. SRMs are typically purchased from independent suppliers who prepare them and certify the analyte concentrations. Results are evaluated by comparing results obtained against the known quantity and the acceptable range of results supplied by the manufacturer.

Table 7-2 Laboratory Quality Control Sample Frequency

QA/QC Sample Type	Minimum Sampling Frequency	Acceptance Limits
Laboratory Replicate/Split	One per batch or per 20 samples (5%), per sampling event.	The relative percent difference between the primary sample result and duplicate sample result should meet the objective for precision.
Method Blank	One per batch or per 20 samples (5%).	Procedural blanks should be below 10x the MDL.
Matrix Spike/Matrix Spike Duplicate (MS/MSD's)	One per batch or per 20 samples (5%), per sampling event.	The percent recovery should be within the accuracy acceptance limits.
Laboratory Control Spike (LCS)	One per batch or per 20 samples (5%).	The percent recovery should be within the accuracy acceptance limits.
Standard Reference Material (SRM)	One per batch or per 20 samples (5%).	The percent recovery should be within the accuracy acceptance limits.

Table 7-3 Recommended Laboratory Quality Control Samples by Constituent (Water)

Analyte	Laboratory Replicate	Method Blank	MS/MSD	LCS	SRM
Nutrients (Water)					
Total Nitrogen	-	✓	✓	✓	-
Total Phosphorus	-	✓	✓	✓	-
Nitrate (NO_3-N)	-	✓	✓	✓	-
Nitrite (NO_2-N)	-	✓	✓	✓	-

7.3 Instrument/Equipment Testing, Inspection, and Maintenance

7.3.1 Sampling Equipment

Prior to each sampling event, field sampling equipment will be checked for proper operation. Field technicians will be responsible for preparing sampling kits that include field logs, COC forms, sample labels, sampling bottles, field equipment and tools. Equipment will be inspected for damage when first handed out and returned from use.

7.3.2 Analytical Instruments

The laboratory will maintain analytical equipment in accordance with their QA Manuals, which include those specified by the manufacturer and those specified by the method. If deficiencies occur, the laboratory will resolve and document the issue in accordance with their QA procedures.

If failures or errors occur with analytical instrumentation, the proper corrective action must be taken. The laboratory is responsible for taking the appropriate measures in accordance with their QA procedures and/or manufacturer's agreements. The Laboratory Manager is responsible for notifying the Project Manager. Refer to Section 6.3.4 for more details regarding corrective action procedures.

7.4 Instrument/Equipment Calibration and Frequency

All laboratory equipment is calibrated based on manufacturer recommendations and accepted laboratory protocol. The laboratory maintains calibration practices as part of their method Standard Operating Procedures (SOPs) maintained in their laboratory by their Laboratory Manager/QA officer and can be provided upon request.

7.5 Data Management

7.5.1 Laboratory Data Management

The Project Manager is responsible for leading laboratory data management. Overall management of the data will be consistent with established procedures for stormwater monitoring projects. The Reporting and Laboratory Coordinator will be responsible for tracking the analytical process to assure that the laboratory is meeting the required turnaround times and providing a complete deliverable package. The laboratory will conduct the quality control checks prior to data submittal, for more details regarding laboratory quality assurance and record keeping protocols refer to the QA Manual. The Reporting and Laboratory Coordinator receives the original hard copy from the laboratory, verifies completeness, and logs the date of receipt. Analysis results will be electronically sent to the Database Manager following the completion of quality control checks by the laboratory. Data will be screened for the following major items:

- A 100 percent check between electronic data provided by the laboratory and the hard copy reports
- Conformity check between the COC forms and laboratory reports
- A check for laboratory data report completeness
- A check for typographical errors on the laboratory reports
- A check for suspect values

The originals are then transferred to the Project Manager and filed with all other original project documentation in order to maintain complete project records.

Following the initial screening, a more complete QA/QC review process will be performed, which will include an evaluation of holding times, method and equipment blank contamination, and analytical accuracy and precision.

The laboratory will be requested to provide data in both hard copy and electronic formats. The form of electronic submittals will conform to reporting protocols that are compatible with the SWAMP. A relational database will be developed and used for all data. Laboratory data will be maintained and managed with Microsoft Excel and/or Microsoft Access by the Database Manager.

The Database Manager will control the access to the project's database. The laboratory EDDs will be maintained in a file separate to the cumulative database so the original is maintained and can be used as a reference. If data is reissued, the file name will include the date and the word 'revised'. To manage the revision and prevent duplicate entries, the erroneous dataset will be removed from the database prior to uploading the revised dataset.

The Laboratory Manager will maintain their respective analytical laboratory records. The Project Manager will oversee the actions of these persons and will arbitrate any issues relative to records retention and any decisions to discard records. All original laboratory notebooks and data summaries will be maintained in secure areas and electronic databases will be maintained and backed up.

7.5.2 Field Data Management

The Field Coordinator will be responsible for the proper management of field measurement and observation data. The Field Coordinator will review all Field Conditions Data Log Sheets for completeness and maintain the original hardcopies in the project file. The Field Conditions Data Log Sheet responses will also be manually entered into an electronic version of the Field Conditions Data Log Sheet and these fields will be saved in the Microsoft Access Database. The data will be manually entered by one individual and the entries will be checked against the hard copies for accuracy by a second individual. Photographs of the monitoring sites taken by field personnel will be uploaded into the project file within three days of taking the photograph. Field team members will name the photographs using the photograph naming convention developed specifically for this project.

8. Quality Assurance Project Plan (QAPP)

A comprehensive Quality Assurance Project Plan (QAPP) consistent with the SWAMP QAPP is included in Appendix C. The QAPP includes sections on Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability.

9. Data Analysis and Reporting

Monitoring in accordance with this MRP plan will continue until the city of Carson has established compliance with the final WLAs. Compliance will be based on three contiguous years of monitoring data wherein monthly average concentrations are at or below the final WLAs for Total Nitrogen and Total Phosphorous. Once compliance with final WLAs is established, the results of this MRP plan and other available information may be used to revise the amount of monitoring required to demonstrate continued TMDL compliance under a revised MRP plan or other Regional Board order.

9.1 Annual Monitoring Reports

The data collected as described in this MRP plan shall be compiled and reported to the Regional Board annually beginning one year from the date of approval of the plan. The report will include the results

from the preceding year and will be submitted to the Regional Board within 45 days of the end of each reporting year. Compliance will be based upon the monthly average concentration.

Data transmitted shall include:

- A discussion of the city of Carson's compliance with interim and final WLAs and targets set for nutrients in Machado Lake.
- A tabular database in Microsoft Excel or Access format including: Sample Dates, Sample Location, Laboratory Results, and Detection Limits.
- Copies of field observation/sampling comment logs in PDF or equivalent format.
- A discussion of any requested changes or modifications to this MRP plan along with supporting documentation.
- Results of source tracking investigations included in an appendix.

A description of the technical design and rationale for source tracking investigations planned for the coming year will be included as an attachment or appendix to the annual monitoring report.

The Annual Report shall be signed by the appropriate city of Carson representative, and transmitted electronically to the Regional Board. The certification shall read:

> *I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.*
>
> *Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility, of a fine and imprisonment for knowing violations.*
>
> *Executed on the _____ day of _____, 20____*
>
> *Printed Name: _____ Title: _____*

9.2 Receiving Waters Limitation Compliance Reports

In the event that the monitoring site described herein is deemed out-of-compliance with interim or final WLAs, the annual monitoring reports prepared as part of this MRP plan may be used by the city of Carson to prepare a Receiving Waters Limitation Compliance Reports (if required by the Regional Board).

Appendix A

Field Conditions Data Log Sheet

Field Conditions Data Log Sheet

MONITORING PROGRAM / MAINTENANCE

☐ Dry-Weather Monitoring ☐ Wet-Weather Monitoring ☐ Land Use Monitoring ☐ Long-Term Monitoring

GENERAL SITE DESCRIPTION

Site Id _____ Discharge Area _____ Intersection/Location _____

Field Crew _____ Date _____ Time _____ Photo Taken ☐ Yes # _____ ☐ No

Conveyance ☐ Manhole ☐ Catch Basin ☐ Outlet ☐ Concrete Channel ☐ Natural Creek ☐ Earthen Channel ☐ Curb/Gutter
(Check one only)

ATMOSPHERIC CONDITIONS

Weather ☐ Sunny ☐ Partly Cloudy ☐ Overcast ☐ Fog ☐ Raining

Last Rain ☐ > 72 hours ☐ < 72 hours **Rainfall** ☐ None ☐ < 0.1" ☐ > 0.1"

RUNOFF CHARACTERISTICS

Odor	☐ None	☐ Musty	☐ Rotten Eggs	☐ Chemicals	☐ Sewage	☐ Other _____
Color	☐ None	☐ Yellow	☐ Brown	☐ White	☐ Gray	☐ Other _____
Clarity	☐ None	☐ Slightly Cloudy	☐ Opaque	☐ Other _____		
Floatables	☐ None	☐ Trash	☐ Bubbles/Foam	☐ Sheen	☐ Fecal Matter	☐ Other _____
Deposits	☐ None	☐ Sediment/Gravel	☐ Fine Particles	☐ Stains	☐ Oily Deposits	☐ Other _____
Vegetation	☐ None	☐ Limited	☐ Normal	☐ Excessive	☐ Other _____	
Water Flow	☐ Flowing	☐ Ponded	☐ Moist	☐ Dry	☐ Tidal – Cond (mS/cm) _____	

DRY-WEATHER ONLY

FLOW ESTIMATION WORKSHEETS ☐ N/A

Flowing Creek of Box Culvert		Flowing Pipe		Field Measurement	
Width (ft.)		Diameter (ft.)		pH	
Depth (ft.)		Depth (ft.)		Temp (°C)	
Velocity (ft/sec)		Velocity (ft/sec)		SpCond (µS)	
Flow (gpm)		Flow (gpm)			

Evidence of Overland Flow? ☐ Yes ☐ No ☐ Irrigation Runoff Other _____

LAND USE ONLY

Land Use ☐ Residential ☐ Commercial ☐ Industrial ☐ Agricultural ☐ Park ☐ Open
(Check all that apply)

POST-STORM DATA

Total Flow Volume _____ Composite Sample Aliquot Count _____

Total Rain (in) _____ Total Sample Volume (L) _____

Pollutagraph Sample Times and Flow

Sample#	Time	Flow (cfs)

EQUIPMENT CONDITION ☐ Good ☐ Maintenance/Calibration Required

Samples Collected

- ☐ Water Sample
- ☐ Water Field Duplicate
- ☐ Water Field Blank
- ☐ Sediment Sample
- ☐ Sediment Field Duplicate
- ☐ Sediment Toxicity

Comments

Appendix B

Example Chain-of-Custody Form

Date _____ Page _____ of _____

CHAIN OF CUSTODY RECORD

Assigned LR# _____

CLIENT: _____

ADDRESS _____

_____

Is this the address the final report is to be sent to? Yes ____ No ____
If "No" list mailing address in "Special Instructions" section at the bottom of this Chain of Custody.

PROJECT IDENTIFICATION/LOCATION:

PURCHASE ORDER #:

SAMPLER: (*Print AND Sign*) _____

_____

SAMPLE TURNAROUND TIME:

Requested Turnaround Time (*CIRCLE ONE*)*
Priority Charges Apply to Rush Turn Around Times
RUSH: Same Day 24 Hr 48 Hr 72 Hr
STANDARD: Standard TAT **(5 to 10 Working Days)
Other _____
* Availability of Same Day/24/48/72 Hr TAT Varies Based Upon Test Method Requirements.
**Standard TAT Varies According to Analyses.

CONTACT PERSON: _____

SAMPLED BY (*Circle One*): **Client** **Assoc. Lab Personnel**

PHONE #: ( ) _____

FAX #: ( ) _____

SAMPLE CONDITION INFO - ***FOR LAB USE ONLY:***
Samples Intact: Yes _____ No_____
Sample Seals Intact: Yes _____ No_____ N/A_____
Cooler Seals Intact: Yes _____ No_____ N/A_____

	Sample ID	Sample or Location Description	Date	Time	Matrix (See Codes Below)	# of Containers	Preservatives	Test Required

MATRIX: **GW**=Ground Water **DW**=Drinking Water **WW**=Waste Water **SW**=Storm Water **S**=Solid/Soil **A**=Air **L**=Liquid **F**=Food (*Use the codes shown here to identify the matrix above*)

Relinquished by: (Print AND Sign)***	Received By: (Print AND Sign)	Date/Time:
Relinquished by: (Print AND Sign)***	Received By: (Print AND Sign)	Date/Time:
Relinquished by: (Print AND Sign)***	Received by Lab for Analysis: (Print AND Sign)	Date/Time:

Special Instructions:

***By signing this Chain of Custody you are authorizing the analyses shown above.

_____
(Print AND Sign)

COC DISTRIBUTION:
White with report. **Yellow** to AL. **Pink** to Client's Courier.

Appendix C

Quality Assurance Project Plan

Quality Assurance Project Plan

For:

City of Carson
Machado Lake Nutrient TMDL
Monitoring and Reporting Plan

Prepared for:

City of Carson
2390 E. Dominguez Street
Carson, California 90801

Prepared by:

California Watershed Engineering
2100 E. Howell Avenue, Suite 209
Anaheim, CA 92806-6003

TEL (714) 385-2600 | FAX (714) 385-2605 | www.cwecorp.com

Revised March 27, 2012

Approval Signatures

City of Carson (Municipal Government Agency)

Title:	Name:	Signature:	Date:
Storm Water Quality Programs Manager	Patricia Elkins		

California Watershed Engineering (Project Team)

Title:	Name:	Signature:	Date:
Project Manager	Felipe Vazquez		
QA Officer	Jason Pereira		
Sampling Manager	Vicky Li		
Laboratory Manager	Marycarol Valenzuela		

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Group A Project Management

1.1 Distribution List

The individuals listed in Table 1-1 will receive a copy of the Quality Assurance Project Plan (QAPP).

Table 1-1 Distribution List

Title	Name (Affiliation)	Contact Number	Number of Copies
Storm Water Quality Programs Manager	Patricia Elkins (City of Carson)	(310) 847-3529	1
Project Manager	Felipe Vazquez (CWE)	(714) 385-2600 Ext. 203	1
Quality Assurance Officer	Jason Pereira (CWE)	(714) 385-2600 Ext. 211	1
Sampling Manager	Vicky Li (CWE)	(714) 385-2600 Ext. 204	1
Laboratory Manager	Marycarol Valenzuela (Associated Laboratories)	(714) 771-9909	1

1.2 Project/Task Organization

1.2.1 Involved Parties and Roles

The city of Carson is the municipal government agency overseeing the project. Patricia Elkins is the city's Storm Water Quality Programs Manager and has responsibility for program oversight.

California Watershed Engineering (CWE) is responsible for conducting the Machado Lake Nutrient Total Maximum Daily Load (TMDL) Monitoring and Reporting Program (MRP). Vik Bapna is the Contract Project Manager for CWE and is responsible for managing the contract. CWE is responsible for the overall organization and completion of the monitoring program, and reporting the results of the monitoring program.

CWE will coordinate sample collection, laboratory analysis, data management, data analysis, and reporting. Felipe Vazquez is the CWE Project Manager and is responsible for project coordination and overall project development. He is also responsible for scheduling, budget management, and oversight of all project plans and report development. Vicky Li is the CWE Sampling Manager and is responsible for implementing the monitoring activities. Jason Pereira is the CWE Quality Assurance Officer and is responsible for overseeing the project quality assurance and quality control procedures implemented during sampling, laboratory analysis, data management, and data analysis. Jason Pereira is also the CWE Health and Safety Officer and is responsible for implementation of the project Health and Safety Plan and practices. Tyler Pham is responsible for preparation of the field effort and monitoring events, field sampling equipment and installation; development of project plans and reports and coordination with the laboratory, developing and maintaining a database of the project data.

Associated Laboratories, located in Orange, California, is responsible for the analysis of all water samples. Marycarol Valenzuela is the Associated Laboratories Laboratory Manager. She will make sure that samples are analyzed in accordance with the methods and quality assurance requirements outlined both in this QAPP and the project MRP.

Table 1-2 summarizes the responsibilities of the involved personnel and their contact information. The organizational chart is provided on Figure 1-1.

Table 1-2 Personnel Responsibilities

Name	Organizational Affiliation	Title	Contact Information (Telephone, Fax, email)
Patricia Elkins	City of Carson	Storm Water Quality Programs Manager	Tel (310) 847-3529 Fax (310) 830-0946 pelkins@carson.ca.us
Felipe Vazquez	CWE	Project Manager	Tel (714) 385-2600 x203 Fax (714) 385-2605 fvazquez@cwecorp.com
Vik Bapna	CWE	Contract Project Manager	Tel (714) 385-2600 x212 Fax (714) 385-2605 vbapna@cwecorp.com
Vicky Li	CWE	Sampling Manager	Tel (714) 385-2600 x204 Fax (714) 385-2605 vli@cwecorp.com
Jason Pereira	CWE	Quality Assurance Officer and Health and Safety Lead	Tel (714) 385-2600 x211 Fax (714) 385-2605 jpereira@cwecorp.com
Tyler Pham	CWE	Field Monitoring and Equipment Coordinator and Reporting/Laboratory and Database Coordinator	Tel (714) 385-2600 x207 Fax (714) 385-2605 tpham@cwecorp.com
Marycarol Valenzuela	Associated Laboratories	Laboratory Manager	Tel (714) 771-9909 Fax (714) 538-1209 mValenzuela@associatedlabs.com

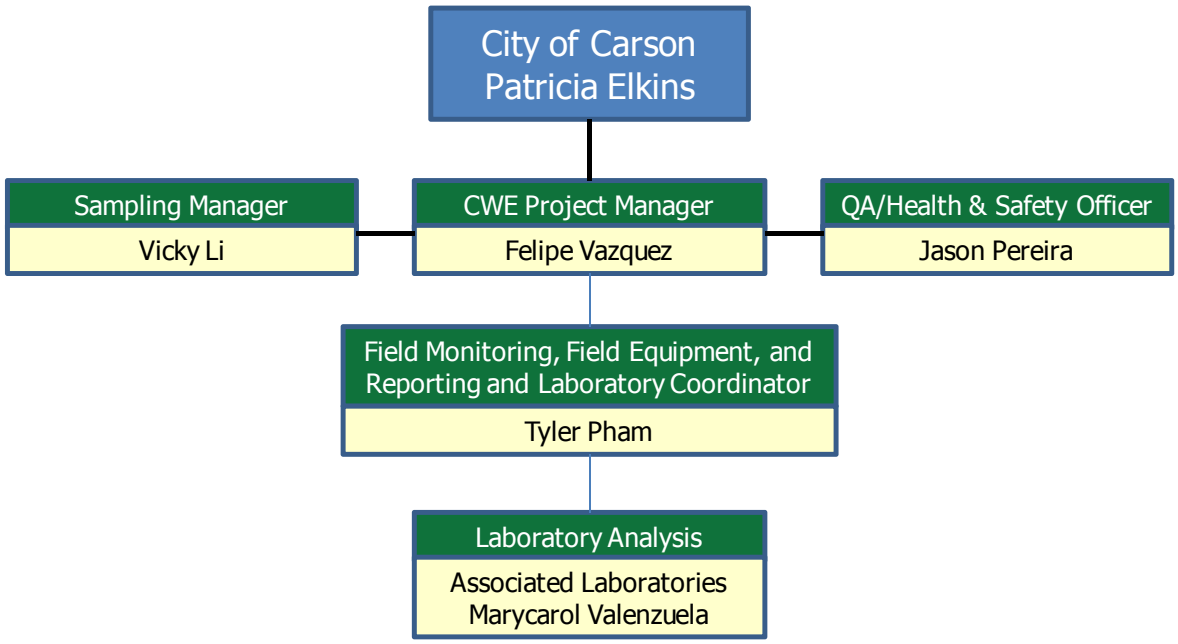


Figure 1-1 Organization Chart

1.2.2 Quality Assurance Officer Role

Jason Pereira, is CWE's Quality Assurance (QA) Officer and the QA Officer for this project. The QA Officer's role is to establish the quality assurance and quality control procedures in this QAPP as part of the sampling, field analysis, and data management and analysis procedures. Mr. Pereira will also work with Associated Laboratories by communicating all quality assurance and quality control issues contained in this QAPP.

The QA officer will also review and assess all procedures during the project against QAPP requirements. The QA officer will report all findings to the Project Manager, including all requests for corrective action. The QA officer may stop all actions, including those conducted by any laboratory, if there are significant deviations from required practices or if there is evidence of a systematic failure.

1.2.3 Persons Responsible for QAPP Update and Maintenance

CWE's Project Manager and QA Officer are responsible for creating and maintaining this QAPP. Changes and updates to this QAPP may be made by CWE's Project Manager and QA Officer. The Project Manager will be responsible for making the changes and making sure these updates are provided to each of the participating agencies. Previous versions of the QAPP should be deleted from project files to avoid any confusion as to current versions of the QAPP.

1.3 Problem Definitions/Background

1.3.1 Problem Statement

The city of Carson is undertaking this project to assess compliance with the Machado Lake Nutrient TMDL and interim and final Waste Load Allocations (WLAs). The MRP will measure the progress of pollutant load reductions and improvements in water quality. The MRP will:

- Determine attainment of total nitrogen, total phosphorus, ammonia, dissolved oxygen, and chlorophyll a numeric targets.
- Determine compliance with the WLA for total nitrogen and total phosphorus.
- Monitor the effect of implementation actions on lake water quality.

1.3.2 Decisions or Outcomes

The city of Carson contracted CWE to implement the Machado Lake Nutrient TMDL MRP to assess compliance with the Machado Lake Nutrient TMDL and interim and final WLAs. This monitoring program will evaluate dry- and wet-weather water quality for the following constituents:

- Total nitrogen
- Total phosphorus
- Nitrate (NO_3-N)
- Nitrite (NO_2-N)

1.3.3 Water Quality or Regulatory Criteria

The Machado Lake Nutrient TMDL established numeric targets for the impaired receiving water body. These numeric targets are summarized in Table 1-3.

Table 1-3 Numeric Targets	
Indicator	**Numeric Target**
Total Phosphorus	0.1 mg/L monthly average
Total Nitrogen (TKN + NO_3-N + NO_2-N)	1.0 mg/L monthly average
Ammonia – N	5.95 mg/L one-hour average
Ammonia – N	2.15 mg/L 30-day average
Dissolved Oxygen	5 mg/L single minimum measured 0.3 meters above the sediments
Chlorophyll a	20 µg/L monthly average

The Machado Lake Nutrient TMDL established and assigned dry- and wet-weather interim and final WLAs to urban stormwater dischargers subject to a Municipal Separate Storm Sewer System (MS4) discharge permit. The city of Carson is named in the TMDL as an MS4 Permittee that is responsible for discharges to Machado Lake.

The TMDL outlines three options for compliance. Interim and final WLAs are summarized in Table 1-4 and can be demonstrated through one of the following methodologies:

- Concentration-based WLAs with in-lake monitoring.
- Concentration-based WLAs with monitoring at the end of the city of Carson's drainage system (end-of-pipe).
- Mass-based WLAs with end-of-pipe monitoring.

Table 1-4 Interim and Final Waste Load Allocations		
Compliance Date	**Interim Total Phosphorus WLAs (mg/L)**	**Interim Total Nitrogen (TKN + NO3-N + NO2-N) WLAs (mg/L)**
March 11, 2009	1.25	3.50
March 11, 2014	1.25	2.45
Sept. 11, 2018 (Final WLAs)	0.1	1.00

1.4 Project/Task Description

1.4.1 Work Statement and Produced Products

The project consists of monitoring discharges from the city of Carson's Machado Lake Subwatersheds. This monitoring program is comprised of two components in order to fulfill the project objectives that are discussed in Section 1.3.2:

- Dry-Weather Monitoring
- Wet-Weather Monitoring

1.4.1.1 Dry-Weather Monitoring

The purpose of the dry-weather monitoring component is to measure the baseline level of the required constituents and measure the progress of pollutant load reductions and improvements in water quality to demonstrate compliance with the Machado Lake Nutrient TMDL and interim and final WLAs. Dry-weather monitoring will include the collection of grab water samples and visual observations at the sampling site. If no flow is present then an alternate sample location will be selected from the list of secondary sites within the same drainage area. Secondary sites selected will be located on the upstream tributaries to the main stormwater conveyance system. Dry-weather monitoring will be performed monthly through September 11, 2018.

1.4.1.2 Wet-Weather Monitoring

The purpose of the wet-weather monitoring is to characterize the relative contributions of targeted pollutants from the city of Carson's Machado Lake Subwatersheds. Wet-weather monitoring will include the collection of grab water samples and visual observations at the sampling site. Wet-weather monitoring will be performed twice during the rainy season (October 1st through May 31st) through September 11, 2018.

1.4.2 Constituents to be Monitored and Measurement Techniques

The analyses that will be conducted for the sampling program and the analysis methods are listed in Table 1-5.

Table 1-5 Water Analytical Constituents

Constituent	Matrix	Method
Nutrients		
Total Kjeldahl Nitrogen	Water	EPA 351.3
Total Phosphorus	Water	EPA 365.2/SM 4500-P E
Nitrate (NO_3-N)	Water	EPA 353.2/SM 4500-NO3-E
Nitrite (NO_2-N)	Water	EPA 353.2/SM 4110-B

1.4.3 Project Schedule

Table 1-6 Project Schedule Timeline

Activity	Date (MM/DD/YY)		Deliverable	Deliverable Due Dates
	Anticipated Date of Initiation	Anticipated Date of Completion		
Sample Collection	01/01/2012	09/11/2018	None	N/A
Annual Water Quality Monitoring Reports	01/01/2013	10/26/2018	Annual Water Quality Monitoring Report	02/14/2013 02//14/2014 02/14/2015 02/14/2016 02/14/2017 10/26/2018

1.4.4 Geographical Setting

The city of Carson is located in southern Los Angeles County, surrounded by the Cities of Compton, Long Beach, and Los Angeles, and Los Angeles County unincorporated areas and communities. While the city is 18.9 square miles in size, only a small portion of the southwestern quadrant is tributary to the Wilmington Drain and Machado Lake.

The city's tributary drainage area is approximately 1.9 square miles and can be divided into three distinct subwatersheds. Drainage Area No. 1 (DA 1) consists of mixed runoff from the cities of Carson, Los Angeles, and Torrance, unincorporated County areas, and California Department of Transportation (Caltrans) right-of-way. Discharges from Drainage Area No. 2 (DA 2) are from the cities of Carson, Lomita, Los Angeles, and Torrance, unincorporated County, and Caltrans. All city of Carson runoff within this area is from the Sanitation Districts of Los Angeles County Joint Water Pollution Control Plant facility. Runoff from Drainage Area No. 3 (DA 3) is almost exclusively from the city of Carson with the exception of a small area in the upper subwatershed, approximately 34.56 acres, and another small downstream area both from the city of Los Angeles. This drainage area best represents the discharges likely to emanate from the city's different land use types. The reason for this is that DA 3 is predominantly from the city of Carson and the composition of land use types within this drainage area are similar to those of DA 1 and 2 combined. Therefore, the dry- and wet-weather monitoring location is at the downstream end of DA 3.

1.4.5 Constraints

The sample location will require further coordination with or permission of access from city of Carson and Los Angeles County Flood Control District. CWE will contact, coordinate, and complete any necessary paperwork and access permits.

Traffic control permits may be required to access the sample location in the right-of-way. Traffic Control Permits take an estimated five days to process and are valid for a limited time only. Traffic controls are necessary for the safety of the field crew and to minimize the overall impact to the flow of traffic on the city streets.

Safety of the field staff is always the primary concern, and therefore, samples will not be collected when a situation is deemed unsafe. Dry-weather conditions may prevent the collection of samples due to insufficient runoff.

1.5 Quality Objectives and Criteria for Measurement Data

Data quality objectives for this project will include the following:

- Accuracy
- Precision
- Completeness

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured value. The accuracy of chemical measurements will be checked by performing tests on a standard prior to and/or during sample analysis. A standard is a known concentration of a certain solution. Standards can be purchased from chemical or scientific supply companies. Standards might also be prepared by a professional partner (e.g., a commercial or research laboratory). The standard used to determine accuracy by Associated Laboratories is called a laboratory control material (LCM) or Certified Reference

Material (CRM), which is a sample with a matrix similar to the sample being tested that contains analytes of interest at known or certified concentrations. The concentration of the standards will be unknown to the analyst until after measurements are determined. The concentration of the standards should also be within the mid-range of the equipment. Recovery measurements are determined by spiking a replicate sample in the laboratory with a known concentration of the analyte. Accuracy of the project data will be determined by the analysis of matrix spike/matrix spike duplicates (MS/MSD), laboratory control spikes (LCS), positive controls, standard reference materials (SRMs), and comparison to the accuracy objectives specified in Table 1-7.

Precision measurements will be determined by comparing results from matrix spike duplicates, blank spikes, laboratory replicates, and field duplicates to the precision objectives specified in Table 1-7. Precision describes how well repeated measurements agree. The evaluation of precision described here relates to repeated measurements/samples collected in the field (field duplicates) or the laboratory (laboratory replicates and MS/MSD).

Completeness is the fraction of planned data that must be collected to fulfill the statistical criteria of the project. There are no statistical criteria that require a certain percentage of data. However, it is expected that 90 percent of all measurements could be taken when anticipated. This accounts for adverse weather conditions, safety concerns, and equipment problems. The project team will determine completeness by comparing the number of measurements planned to be collected with the number of measurements actually collected that were also deemed valid. An invalid measurement would be one that does not meet the sampling method requirements and the data quality objectives.

The data quality objectives (DQOs) for the laboratory DQOs are summarized in Table 1-7.

Table 1-7 Data Quality Objectives for Laboratory Measurements

Group	Parameter	Units	Target Reporting Limit	Accuracy (Recovery)	Precision RPD	Completeness
Nutrients (Water Analysis)	Total Nitrogen	mg/L	0.4	70-130%	0-20	90%
	Total Phosphorus	mg/L	0.05	70-130%	0-20	90%
	Nitrate (NO_3-N)	mg/L	0.05	80-120%	0-20	90%
	Nitrite (NO_2-N)	mg/L	0.03	80-120%	0-20	90%

1.6 Special Training Needs/Certification

1.6.1 Specialized Training or Certifications

Associated Laboratories, in Orange, California will be providing general laboratory services for this project, which includes analysis of water chemistry samples. Associated Laboratories is certified by the California Environmental Laboratory Accreditation Program (ELAP Certification #1338) for the analyses of: microbiology, inorganics, toxic chemical elements, volatile organic chemistry, semi-volatile organic chemistry for both drinking water and wastewater; whole effluent toxicity for wastewater; inorganic chemistry, extraction tests, volatile organic chemistry, semi-volatile organic chemistry, toxicity bioassay, and physical properties for hazardous waste; and microbiology for recreational water.

1.6.2 Training and Certification Documentation

Field personnel will be properly trained in the use of monitoring equipment and clean sample handling techniques along with all appropriate health and safety protocols prior to conducting monitoring activities. Specifically, the following elements will be included in the training of all CWE field personnel:

- Review of Health and Safety Plan
- Classroom training
- Field training

CWE and Associated Laboratories maintain records of training performed. Documentation consists of records of the training dates and instructors. Records can be obtained if needed through CWE's Quality Assurance Officer and Associated Laboratories' Laboratory Manager.

1.6.3 Training Personnel

CWE's Quality Assurance Officer, Sampling Manager, Field and Monitoring Coordinator, and Field Equipment Coordinator will provide training to the monitoring personnel. The Sampling Manager will train field personnel in sampling protocols and procedures in accordance with the MRP and QAPP. The Sampling Manager or Project Manager will communicate any updates or revisions of these protocols in a timely manner.

Associated Laboratories provides training to all staff members to ensure they are adequately qualified and trained to perform assigned tasks. Details of Associated Laboratories training plans are described in Associated Laboratories' Quality Assurance Manual Appendix F.

1.7 Documents and Records

All field observations will be recorded in Field Conditions Data Log Sheet provided in the MRP. Chain-of-custody (COC) forms will be completed for all water samples before the samples are delivered to the laboratory. Field sheets and COCs will be scanned and stored as an electronic PDF by the Project Manager for a minimum of five (5) years from the time the MRP is completed.

The Reporting and Laboratory Coordinator receives the analytical results in original hard copy from the laboratory, verifies completeness, and logs the date of receipt. The originals are then transferred to the Project Manager and filed with all other original project documentation in order to maintain complete project records. In addition to hard copies, the laboratory will also provide analytical data in electronic format. The form of electronic submittals will conform to reporting protocols that are compatible with the Surface Water Ambient Monitoring Program (SWAMP). A relational database will be developed by CWE and used for all data. Laboratory data will be maintained and managed with Microsoft Excel and/or Microsoft Access by the Database Manager. Following project completion, a copy of the database will be filed with all other original project documentation. An electronic copy of the database, along with the field forms, will also be provided to the city of Carson for their records.

Copies of this QAPP will be distributed electronically to the individuals listed in the Section 1.3 Distribution List. Hard copies of the QAPP will be available upon request. Updates to this QAPP will be distributed to the same individuals, and all previous versions will be discarded from the project file. A hard copy of the QAPP will be filed with the remaining project documentation. CWE will prepare an annual water quality monitoring report and submit to the city of Carson. CWE and the city of Carson will each have a copy of this report in their records. Additional details regarding data management is discussed in Section 2.10.

Table 1-8 Document and Record Retention, Archival, and Disposition Information

Records	Identify Type Needed	Retention	Archival	Disposition
Project Plan	Monitoring and Reporting Program	Paper/Electronic	Document	Minimum 5 years
	QAPP	Paper/Electronic	Document	Minimum 5 years
Field Data	Field Conditions Data Log Sheets	Paper/Electronic	Project File/PDFs	Minimum 5 years
	Photographs	Electronic	Project File	Minimum 5 years
Sample Collection Records	Chain-of-Custody	Paper/Electronic	Project File	Minimum 5 years
Analytical Records	Lab Notebooks	Paper	Notebook	Minimum 5 years
	Lab Reports (include COCs)	Electronic	Notebook/Excel	Minimum 5 years
	Electronic Data File	Electronic	Database	Minimum 5 years
Assessment Records	QA/QC Assessment	Paper/Electronic	Document	Minimum 5 years
	Final Report	Paper/Electronic	Document	Minimum 5 years

Group B Data Generation and Acquisition

2.1 Sampling Process Design

The Machado Lake Nutrient TMDL MRP plan provides a complete description of the monitoring approach, rationale for site selection, and sampling logistics. The information contained in this section provides a general overview and references the appropriate section of the MRP plan to obtain more detailed descriptions.

2.1.1 Monitoring Program

The monitoring program designed to accomplish the project objectives outlined in Section 1.3.2 of this QAPP include dry- and wet-weather monitoring. Dry- and wet-weather monitoring will employ water sampling and visual observations to measure the progress of pollutant load reductions and improvements in water quality as a result of implementation actions to assess compliance with the Machado Lake Nutrient TMDL and interim and final WLAs.

Section 1.4.1 of this QAPP provides an overview of the monitoring program and a more detailed description of the monitoring program is discussed in Sections 2, 3, 4, and 5 of the MRP plan.

2.1.2 Monitoring Location (Rationale for Site Selection)

The city of Carson has selected a monitoring site that is representative of the three drainage areas and land uses tributary to Machado Lake. The proposed monitoring location directly monitors 547 acres of the city's 1,207 acres that are tributary to Machado Lake. This monitoring station will provide direct monitoring of all the major land uses found within the three drainage areas to accurately characterize the water quality of the city's discharges. The selected monitoring location is in Drainage Area No. 3 which has similar land use designations and ratios to those found in Drainage Area Nos. 1 and 2 combined.

Sections 1.6 and 3 of the MRP plan provide more detail on the rationale for site selection.

2.1.3 Monitoring Events

Dry-weather grab samples will be collected on a monthly basis, unless a qualifying wet-weather sample is collected first. Samples will be collected in approved containers using standard sampling methods. Two annual wet-weather grab samples are also scheduled to be collected. The two wet-weather samples can substitute for two of the monthly dry-weather samples. If a qualifying wet-weather event does not occur or is not anticipated to occur for the month, the city of Carson will collect dry-weather samples. Dry- and wet-weather sampling frequency details are provided in Section 5.1 of the MRP plan.

2.1.4 Monitoring/Sampling Logistics

The MRP plan provides additional details regarding preparation and logistics for each dry- and wet-weather monitoring event in Section 6.

Dry-weather sampling will be conducted monthly. The sampling team will be used to deliver samples to the laboratory within the required holding times. The sampling team will be comprised of two field technicians to document visual observations and collect samples. Field observations will be recorded on the Field Conditions Data Log Sheet provided in Appendix A of the MRP plan. Samples will be placed on ice immediately and remain on ice until delivered to the laboratory within holding time requirements.

Similarly, wet-weather sampling will occur twice a year and substitute for two dry-weather sampling events. The following criteria will be used to determine if mobilization will occur for an impending storm event to collect a wet-weather sample:

- Storms must be forecasted to produce at least 0.10 inches of rain.
- The probability of precipitation occurring must be greater than 60 percent.
- Storm events must be preceded by at least 72 hours of dry conditions (<0.10 inches of precipitation).

2.1.5 Laboratory/Sample Distribution

Upon receipt of the water samples, the laboratory will shake the samples until they are homogeneous and dispense the sample contents into containers that contain the required volume needed for analysis of the constituents. The laboratory will preserve the water samples using the appropriate preservative, and will conduct the analysis within the maximum holding time limits.

2.2 Sampling Methods

All samples will be collected using manual grab sampling methods, during dry- and wet-weather events. All sampling procedures will adhere to the guidelines found in the SWAMP sampling Standard Operating Procedures (SOP), "Field Collection of Water Samples." Samples will be collected by-hand, when possible, or by using an extension pole with a bottle attachment. If necessary, a portable battery-powered peristaltic pump, with properly cleaned tubing, will be used to collect the samples during low-flow conditions, where the extension pole is not effective. All sampling equipment will be properly cleaned prior to each sampling event. When using the extension pole, ultrapure de-ionized water will be used to rinse off any residual site water from the apparatus. If the peristaltic pump is used, a new properly cleaned length of tubing will be used at each sampling location to avoid cross-contamination of the samples.

A two-person team will conduct all sampling events. The sampling team will have access to a cellular phone in order to alert rescue agencies should an accident occur. Sampling will be postponed if the sampling team determines that the conditions are unsafe. Failure to collect a sample due to safety concerns or technical issues will be promptly reported to the Project Manager, who will determine if any corrective action is needed and make arrangements to collect a replacement sample, if possible. The QA Officer will document sampling failures and the effectiveness of corrective actions.

2.3 Sample Handling and Custody

The laboratory will provide appropriate sample containers according to Table 2-1. All samples will be pre-labeled with the project name, site ID, sample type, bottle number, sampler name, preservative, and analysis. All sample bottles will also be pre-labeled with a unique Sample ID to track the sample throughout its analyses. At the time of sample collection, the sample labels will be completed in the field with the date and time. The Sample IDs will also be entered directly onto the Field Conditions Data Log Sheets and the COC Forms. The COC forms will accompany the collection of all samples.

The following sample handling protocols will be followed when collecting samples to minimize the possibility of contamination:

- Previously unused sample bottles will be employed. Sample bottles and bottle caps will be protected from contact with solvents, dust, or other contaminants during storage and bottle handing.

- The grab sampler will make an effort, within reason, to prevent large gravel and uncharacteristic floating debris from entering the sample containers. The sampler will also make an effort to not stir up sediments at the bottom of the storm drain.

- The inside of the sampling container will not be touched to the maximum extent practicable during preparation and sampling activities.

- Vehicle engines will be turned off during sampling activities to minimize exposure of samples to exhaust fumes.

- All samples will be collected in accordance with the "clean sampling" techniques outlined in the MRP.

- Manual water grab samples will be collected by inserting the transfer container under or down current of the direction of flow, with the container opening facing upstream.

- Once sample containers are filled, they will be promptly placed on ice, in a clean cooler (target temperature 6 degrees Celsius), in the dark and transported to the laboratory for processing to meet holding times. All necessary pre-processing for analysis, such as filtration and acidification, will take place in the laboratory by certified personnel.

- After the field crew collects and delivers the samples to the laboratory, the laboratory will conduct the analysis within the holding times listed in Table 2-1. These field and laboratory activities will be coordinated to make sure all samples are handled within the proper holding time.

After the laboratory receives the water samples, the certified laboratory technicians will dispense the sample contents into containers that contain the required volume specified in Table 2-1. The laboratory will preserve the water samples using the appropriate preservative and the laboratory will conduct the analysis within the maximum holding time limits.

Table 2-1 Sample Handling and Custody

Constituent	Container Type	Minimum Sample Volume	Preservation	Holding Time
Nutrients (Water Analysis)				
Total Kjeldahl Nitrogen	Polyethylene	500 mL	6°C preserved in the lab wit H_2SO_4	48 Hours
Total Phosphorus	Polyethylene	500 mL	6°C preserved in the lab wit H_2SO_4	28 Days
Nitrate (NO_3-N)	Polyethylene	500 mL	6°C	48 Hours
Nitrite (NO_2-N)	Polyethylene	500 mL	6°C	48 Hours

2.3.1 Chain-of-Custody Procedures

The laboratory will supply the Chain-of-Custody (COC) forms that will be utilized by the sampling team. COC procedures will be used for all samples throughout the collection, transport, and analytical process to ensure the most accurate results. COCs will be pre-printed along with the bottle labels and will contain the same data as the labels. The COCs will be completed in the field with dates, times, and sample team names, and will be cross-checked with the bottles to make sure proper samples have been collected. Documentation of sample handling and custody will include the following:

- Sample identification;
- Type of sample;
- Sample collection date and time;
- Any special notations on sample characteristics or analysis;
- Analyses to be performed;
- Initials of the sampling team member that collected the sample; and
- Date the sample was delivered to/sent to the laboratory.

The COC forms for the samples will be transported with the samples to the analytical laboratory. Sampled water will be kept properly chilled and transferred to an analytical laboratory within holding times. When custody of the samples is transferred to the laboratory, the COC will be signed and dated, and a PDF copy will be sent from the laboratory. An example of a COC form is included in Appendix G. The COCs will be reviewed by personnel at the receiving laboratory to make sure no samples have been lost in transport. The laboratory will also verify that each sample has been received within holding times. COC records will be included in the final reports prepared by the analytical laboratory and are considered an integral part of the report. Analytical methods and detection limits for this project are listed in Table 2-2. The detection limits described in Table 1-7 are target detection limits.

2.3.2 Sample Disposal Procedures

After analysis, including QA/QC procedures, any excess sample will be disposed of by the analytical laboratory.

2.3.3 Corrective Action Procedures

Corrective action is taken when an analysis is deemed suspect for some reason. The reasons include exceedances of the relative percent difference (RPD) ranges, spike recoveries, and blanks. The corrective action varies somewhat from analysis to analysis, but typically involves the following:

- Check of procedure
- Review of documents and calculations to identify any possible error
- Error correction
- Re-analysis of the sample extract, if available, to see if results can be improved
- Complete reprocessing and re-analysis of additional sample material, if it is available

Any failures (e.g., instrument failures) that occur during data collection and laboratory analyses will be the responsibility of the field crew or laboratory conducting the work, respectively. In the case of field instruments, problems will be addressed through instrument cleaning, repair, or replacement of parts or the entire instrument, as needed. Field crews will carry basic spare parts and consumables with them, and will have access to spare parts to be stored at the office. Records of all repairs or replacements of field instruments will be maintained at CWE. The laboratory has procedures in place to follow when failures occur, and will identify individuals responsible for corrective action and develop appropriate documentation. The QA Officer at the laboratory has procedures in place to follow when failures occur, and will identify individuals responsible for corrective action and develop appropriate documentation. Any corrective actions taken will be documented in the laboratory's hard copy deliverable or in a Corrective Action Plan. For more information on Associated Laboratories' QA procedures please refer to Appendix F.

2.4 Analytical Methods

Analytical methods are described in the Standard Methods for the Examination of Water and Wastewater (APHA et al, 2005) and US EPA standard methods. The list of constituents, measurement techniques, method detection limits (MDLs), and reporting limits (RLs) is presented in Table 2-2.

Table 2-2 Laboratory Analytical Methods

Analyte/ Analysis	Laboratory/ Organization	Analytical Method		Achievable Laboratory Limits	
		Analytical Method/SOP	Modified for Method Yes or No	MDL (units)	RL (units)
Nutrients (Water)					
Total Kjeldahl Nitrogen	Associated Laboratories	EPA 351.3	No	0.06 mg/L	0.4 mg/L
Total Phosphorus	Associated Laboratories	SM 4500-P E	No	0.016 mg/L	0.05 mg/L
Nitrate (NO_3-N)	Associated Laboratories	EPA 353.2	No	0.02 mg/L	0.05 mg/L
Nitrite (NO_2-N)	Associated Laboratories	EPA 353.2	No	0.005 mg/L	0.03 mg/L

2.5 Quality Control

This section addresses Quality Assurance/Quality Control (QA/QC) activities associated with both field sampling and laboratory analyses. The field QA/QC samples are used to evaluate potential contamination and sampling errors introduced prior to submittal of the samples to the analytical laboratory. Laboratory QA/QC samples provide information to assess potential laboratory contamination, analytical precision, and accuracy. If any QA/QC standards are not met, the appropriate corrective actions will be taken in accordance with Section 2.3.3 of this document and the laboratory's QA manual provided in Appendix F.

2.5.1 Quality Assurance/Quality Control

The main types of field QA/QC samples that will be utilized for this MRP are described below and provided in Table 2-3.

1. **Field Blanks** – Field blanks verify that field conditions, field sampling activities, and air deposition are non-contaminating. Field blanks are submitted blind to the laboratory. Sample bottles are filled with reagent-grade, analyte-free deionized water in the field during a sampling event.

2. **Equipment Blanks** – Equipment blanks verify that the sampling containers, sampling equipment, and tubing are contaminant free prior to sampling. A representative number of bottles or sections of tubing from each lot is submitted to the laboratory. The laboratory will use reagent-grade, analyte-free deionized water to fill the bottles or rinse through the tubing and then analyze the water. Blank analysis results are evaluated by checking against reporting limit for that analyte. Results obtained should be less than the reporting limit for each analyte. If results are above the reporting limits then the entire lot must be cleaned and re-analyzed.

3. **Field Duplicates** – Field duplicates evaluate sampling error introduced by both field sampling and laboratory analyses. Field duplicates are submitted blind to the laboratory. Procedures for collecting field duplicates should be the same as those used for collecting field samples. Duplicates of manual grab samples will be collected by filling two grab sample containers at the same time, or in rapid sequence.

4. **Matrix Spike and Matrix Spike Duplicates (MS/MSDs)** – Matrix spikes and matrix spike duplicates are used to assess precision and accuracy of the laboratory analytical method. A matrix spike sample is an aliquot of a field sample spiked with a known amount of analyte and analyzed for spike recovery. A matrix spike duplicate is a duplicate aliquot of the matrix spike sample analyzed separately.

5. **Laboratory Replicate/Split** – A laboratory replicate/split entails a duplicate analysis performed on the contents from the same sample container and assesses the repeatability (precision) of the analytical laboratory's results.

The blank samples, duplicate samples, spike samples, and laboratory replicates need not all come from the same monitoring site during a particular sampling event. However, each of these QA/QC analyses will be provided along with the standard analyses if enough sample volume has been collected. The field QA/QC samples for field blanks and field duplicates are submitted blind to the analytical laboratory.

Table 2-3 Sampling (Field) QC

QA/QC Sample Type	Minimum Sampling Frequency	Constituent Class	Acceptance Limits
Field Blank	Every 20 samples collected at a given site, per sampling event.	All	Field blanks shall find no detectable amounts or less than 1/5 of sample amounts. Accuracy at 1 per culture medium or reagent lot.
Equipment Blank	Sample bottles should be blanked at 10% frequency, or per lot.	All	Equipment blank shall be less than the reporting limit for that analyte.
Field Duplicate	Every 10 samples collected at a given site, or per sampling event.	All	The relative percent difference between the primary sample result and the duplicate sample result should meet the objective for precision listed in Table 1-7.
Matrix Spike/Matrix Spike Duplicate (MS/MSDs)	One per batch or per 20 samples (5%), per sampling event.	Table 2-5	The percent recovery should be within the accuracy acceptance limits listed in Table 1-7.
Laboratory Replicate/Split	One per batch or per 20 samples (5%), per sampling event.	Table 2-5	The relative percent difference between the primary sample result and the replicate result should meet the objective for precision listed in Table 1-7.

2.5.2 Laboratory Quality Assurance/Quality Control

Internal laboratory quality control checks will include the use of laboratory replicates, method blanks, MS/MSDs, laboratory control samples, and SRMs. These quality control samples are described below.

Frequency of analysis is provided in Table 2-4. A breakdown of the associated constituents for each QC sample type is provided in Table 2-5 for water samples.

1. **Laboratory Replicate/Split** – A sample is split by the laboratory into two portions and each sample is analyzed. Once the duplicate analyses have been analyzed, the results are evaluated by calculating the RPD between the two sets of results. This serves as a measure of the reproducibility, or precision, of the sample analysis. Typically, duplicate results should fall within an accepted RPD range, depending upon the analysis.

2. **Method Blanks** – A method blank is an analysis of a known clean sample matrix that has been subjected to the same complete analytical procedure as the field sample to determine if potential contamination has been introduced during processing. Blank analysis results are evaluated by checking against reporting limits for that analyte. Results obtained should be less than the reporting limits for each analysis.

3. **Matrix Spike and Matrix Spike Duplicates (MS/MSDs)** – Matrix spikes and matrix spike duplicates (MS/MSDs) involve adding a known amount of the chemical(s) of interest to one of the actual samples being analyzed. One sample is split into three separate portions. One portion is analyzed to determine the concentration of the analyte in question in an un-spiked state. The other two portions are spiked with a known concentration of the analytes of interest. The recovery of the spike, after accounting for the concentration of the analyte in the original sample, is a measure of the accuracy of the analysis. By determining spike duplicate recoveries, another measure of precision is accomplished. An additional precision measure is made by calculating the RPD of the duplicate spike recoveries. Both the RPD values and spike recoveries are compared against accepted and known method dependent acceptance limits. Analyses outside these limits are subject to corrective action.

4. **Laboratory Control Sample (LCS)** – The laboratory control sample procedure involves spiking known amounts of the analyte of interest into a known, clean, sample matrix to assess the possible matrix effects on spike recoveries. High or low recoveries of the analytes in the matrix spikes may be caused by interferences in the sample. Laboratory control samples assess these possible matrix effects since the LCS is known to be free from interferences.

5. **Standard Reference Material (SRM)** –SRMs may be used in lieu of laboratory control samples. An SRM is a sample containing a known and certified amount of the analyte of interest and is typically analyzed with the analyst not knowing the analyte concentration. SRMs are typically purchased from independent suppliers who prepare them and certify the analyte concentrations. Results are evaluated by comparing results obtained against the known quantity and the acceptable range of results supplied by the manufacturer.

Table 2-4 Laboratory Quality Control Sample Frequency		
QA/QC Sample Type	**Minimum Sampling Frequency**	**Acceptance Limits**
Laboratory Replicate/Split	One per batch or per 20 samples (5%), per sampling event.	The relative percent difference between the primary sample result and duplicate sample result should meet the objective for precision listed in Table 1-7.
Method Blank	One per batch or per 20 samples (5%).	Procedural blanks should be below 10x the MDL.
Matrix Spike/Matrix Spike Duplicate (MS/MSD's)	One per batch or per 20 samples (5%), per sampling event.	The percent recovery should be within the accuracy acceptance limits listed in Table 1-7.
Laboratory Control Spike (LCS)	One per batch or per 20 samples (5%).	The percent recovery should be within the accuracy acceptance limits listed in Table 1-7.
Standard Reference Material (SRM)	One per batch or per 20 samples (5%).	The percent recovery should be within the accuracy acceptance limits listed in Table 1-7.

Table 2-5 Recommended Laboratory Quality Control Samples by Constituent (Water)					
Analyte	**Laboratory Replicate**	**Method Blank**	**MS/MSD**	**LCS**	**SRM**
Nutrients (Water)					
Total Nitrogen	-	✓	✓	✓	-
Total Phosphorus	-	✓	✓	✓	-
Nitrate (NO_3-N)	-	✓	✓	✓	-
Nitrite (NO_2-N)	-	✓	✓	✓	-

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

2.6.1 Sampling Equipment

Prior to each sampling event, field sampling equipment will be checked for proper operation. Field technicians will be responsible for preparing sampling kits that include field logs, chain-of-custody forms, sample labels, sampling bottles, field equipment and tools. Equipment will be inspected for damage when first handed out and returned from use.

2.6.2 Analytical Instruments

Associated Laboratories maintain analytical equipment in accordance with their QA Manual provided in Appendix F, which include those specified by the manufacturer and those specified by the method. If deficiencies occur, the laboratory will resolve and document the issue in accordance with their QA procedures. These SOPs have been reviewed by the Project QA Officer and found to be in compliance with criteria.

If failures or errors occur with analytical instrumentation, the proper corrective action must be taken. The laboratory is responsible for taking the appropriate measures in accordance with their QA procedures and/or manufacturer's agreements. The Laboratory Manager listed in Figure 1-1 is responsible for

notifying the Project Manager. Refer to Section 2.3.3 for more details regarding corrective action procedures.

2.7 Instrument/Equipment Calibration and Frequency

All laboratory equipment is calibrated based on manufacturer recommendations and accepted laboratory protocol. The laboratory maintains calibration practices as part of their method SOPs maintained in their laboratory by their Laboratory Manager/QA officer and can be provided upon request. Information regarding the calibration activities performed by Associated Laboratories is provided in Appendix F.

2.8 Inspection/Acceptance of Supplies and Consumables

All glassware, sample bottles, and collection equipment will be inspected prior to their use. Some sampling containers and caps will be obtained from the participating laboratory. The Sampling Manager and Field Coordinators will be in charge of ordering sampling containers. All ordered supplies will be examined for damage as they are received. Associated Laboratories maintains logbooks for all consumables that are checked against all materials received. Bottles and caps will be inspected for damage prior to sampling, and only sound bottles with intact threads will be used. The container caps will be tested for tightness prior to the transport of samples.

The Sampling Manager and Field Monitoring Coordinator will make sure sufficient field supplies are on hand prior to the start of sampling for each period. Field supplies will be stored at CWE and laboratory supplies will be stored at Associated Laboratories.

Table 2-6 Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies/Consumables	Inspection/Testing Specifications	Acceptance Criteria	Frequency	Responsible Parties
Pre-Cleaned Sample Bottles	Open bottle	Lids screwed on bottles	100%	CWE
Laboratory Glassware	Dirty	Clean	100%	Associated Laboratories
Lab Solvents and Acids	Leaks	No cracks or chips	Prior to use	Associated Laboratories
19-Liter Glass	Laboratory blanked	Pass blanking analysis	New bottles each monitoring event	Associated Laboratories/ CWE
1-Gallon Glass	If not certified pre-cleaned then laboratory blanked	Pass blanking analysis	New bottles each monitoring event	Associated Laboratories/ CWE
125-Milliliter Plastic	Laboratory sterilized	Lids screwed on containers	New bottles each monitoring event	Associated Laboratories
125-Milliliter Glass Container	Laboratory cleaned and blanked	Lids screwed on containers	New bottles each monitoring event	Associated Laboratories/ CWE
Grab Bags	Dirty, open	Sealed bags	New bottles each monitoring event	Associated Laboratories
10-Liter HDPE Cubitainers	Laboratory cleaned and blanked	Lids screwed on containers	New bottles each monitoring event	Associated Laboratories

Table 2-6 Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies/Consumables	Inspection/Testing Specifications	Acceptance Criteria	Frequency	Responsible Parties
Silicone Tubing	Laboratory cleaned and blanked	Pass blanking analysis	New tubing at start of program	Associated Laboratories/ CWE
Teflon Tubing	Laboratory cleaned and blanked	Pass blanking analysis	New tubing at start of program	Associated Laboratories/ CWE
Gloves	New box (Cole Parmer)	New box	Monthly	CWE

2.9 Non-Direct Measurements

There are no non-direct measurements in this project.

2.10 Data Management

2.10.1 Laboratory Data Management

The Project Manager is responsible for leading laboratory data management. Overall management of the data will be consistent with established consultant procedures for stormwater monitoring projects. The Reporting and Laboratory Coordinator will be responsible for tracking the analytical process to assure that the laboratory is meeting the required turnaround times and providing a complete deliverable package. The laboratory will conduct the quality control checks prior to data submittal, for more details regarding laboratory quality assurance and record keeping protocols refer to the QA Manual included as Appendix F. The Reporting and Laboratory Coordinator receives the original hard copy from the laboratory, verifies completeness, and logs the date of receipt. Analysis results will be electronically sent to the Database Manager following the completion of quality control checks by the laboratory. Data will be screened for the following major items:

- A 100 percent check between electronic data provided by the laboratory and the hard copy reports
- Conformity check between the COC forms and laboratory reports
- A check for laboratory data report completeness
- A check for typographical errors on the laboratory reports
- A check for suspect values

The originals are then transferred to the Project Manager and filed with all other original project documentation in order to maintain complete project records.

Following the initial screening, a more complete QA/QC review process will be performed, which will include an evaluation of holding times, method and equipment blank contamination, and analytical accuracy and precision.

The laboratory will be requested to provide data in both hard copy and electronic formats. The form of electronic submittals will conform to reporting protocols that are compatible with the Surface Water Ambient Monitoring Program. A relational database will be developed by CWE and used for all data. Laboratory data will be maintained and managed with Microsoft Excel and/or Microsoft Access by the Database Manager.

The Database Manager will control the access to the project's database. The laboratory EDDs will be maintained in a file separate to the cumulative database so the original is maintained and can be used as a reference. If data is reissued, the file name will include the date and the word 'revised'. To manage the revision and prevent duplicate entries, the erroneous dataset will be removed from the database prior to uploading the revised dataset.

The Laboratory Manager at Associated Laboratories will maintain their respective analytical laboratory records. The Project Manager will oversee the actions of these persons and will arbitrate any issues relative to records retention and any decisions to discard records. All original laboratory notebooks and data summaries will be maintained in secure areas and electronic databases will be maintained and backed up.

2.10.2 Field Data Management

The Field Monitoring Coordinator will be responsible for the proper management of field measurement and observation data. The Field Monitoring Coordinator will review all Field Conditions Data Log Sheets for completeness and maintain the original hardcopies in the project file. The Field Conditions Data Log Sheet responses will also be manually entered into an electronic version of the Field Conditions Data Log Sheet and these fields will be saved in the Microsoft Access Database. The data will be manually entered by one individual and the entries will be checked against the hard copies for accuracy by a second individual. Photographs of the monitoring sites taken by field personnel will be uploaded into the project file within three days of taking the photograph. Field team members will name the photographs using the photograph naming convention developed specifically for this project.

Group C Assessment and Oversight

3.1 Assessments and Response Actions

The Project Manager will be responsible for the day-to-day oversight of the project. The project's QA Officer will review progress of the monitoring program. The managers and coordinators of the project, along with the Project QA Officer, will meet to discuss the siting, sampling, laboratory analyses, data management, and the overall status of the project. This information will be communicated monthly between the city of Carson and the Project Manager and Sampling Manager. The Reporting and Laboratory Coordinator will review laboratory data and the Field Monitoring Coordinator will review field data. The project's QA Officer has the power to halt all sampling and analytical work by the monitoring personnel and Associated Laboratories if the deviations noted are considered detrimental to data quality.

Three types of assessments will be performed as part of this project to ensure that the sampling and analysis activities are in accordance with the approved QAPP. They are as follows:

1. **Surveillance of Sample Collection Activities.** The Field Monitoring Coordinator will be responsible for oversight of sampling activities and will review field datasheets to verify that the samples were collected in accordance with QAPP requirements. The QA Officer will accompany the field crew at least once, toward the beginning of the data collection phase of the project, and again at some later point, if deemed necessary, to audit field activities. If the QA Officer finds any of the field activities to be in violation of QAPP requirements, he has the authority to stop these activities until corrective actions are successfully implemented. These include additional training to improve field team performance and QAPP compliance, and appropriate re-sampling of sites, as needed. The QA Officer will report all such actions to the Project Manager and document it in the project file.

2. **Data Quality Assessment.** The Reporting and Laboratory Coordinator is responsible for reviewing laboratory reports to verify that the performance criteria of the QAPP were met. This will occur following receipt of each report from the contracted laboratory. If it is determined that the precision and accuracy objectives were not met the Reporting and Laboratory Coordinator will notify the QA Officer and Project Manager. Then the contract laboratory QA Officer will review laboratory techniques to minimize errors, and samples will be re-analyzed, if possible.

3. **Assessment of Data Entry.** Once the performance criteria are met, data analysis can be conducted. The Reporting and Laboratory Coordinator and the Sampling Manager will review data files to ensure that errors are detected and corrected.

If an audit discovers any discrepancy, the project's QA Officer will discuss the observed discrepancy with the appropriate personnel responsible for the activity (see Figure 1-1). The discussion will determine whether the information collected is accurate, what caused the deviation, how the deviation impacts data quality, and what corrective actions are necessary as provided in Section 2.3.3. Any corrective actions taken will be verified based on satisfactory collection of data in accordance with the QAPP, following these actions. The QAPP violation(s), corrective action(s), and verification of correction will be reported in a Corrective Action Plan by the QA Officer to the Project Manager and kept on record.

3.2 Reports to Management

CWE will complete an EDD (Electronic Data Deliverable) following the last annually monitored sampling event and submit to the city of Carson. The EDD will contain the following:

- Laboratory results
- Field Forms

The laboratory results will be submitted in Microsoft Access database format. The field forms will include the completed Field Conditions Data Log Sheets in PDF format. Responses to the Field Conditions Data Log Sheets will also be provided in Microsoft Access database format. CWE will prepare a draft and final annual monitoring report and submit to the city of Carson. The report will provide a review and analysis of the data provided in the Electronic Data Deliverable. The draft report will be submitted to the city for a two-week period for review and comment. CWE will address the city's comments and incorporate into the Final Report.

Table 3-1 QA Management Reports

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Electronic Data Deliverable	Annual	02/14/2013 02//14/2014 02/14/2015 02/14/2016 02/14/2017 10/26/2018	CWE	City of Carson
Draft Report	Annual	01/31/2013 01//31/2014 01/31/2015 01/31/2016 01/31/2017 10/12/2018	CWE	City of Carson
Final Report	Annual	02/14/2013 02//14/2014 02/14/2015 02/14/2016 02/14/2017 10/26/2018	CWE	City of Carson

Group D Data Validation and Usability

4.1 Data Review, Verification, and Validation

All analytical data will be reviewed and compared to the DQOs described in Section 1.5. If results fail to meet any DQO, the Reporting and Laboratory Coordinator and/or the project QA Officer will flag them for further review. Batch QA samples will be reviewed to determine the potential cause of failure to meet the DQO. If the cause cannot be readily ascertained, reserve samples will be reanalyzed, if within designated holding times. If subsequent analyses meet the DQO, the samples will be deemed acceptable.

If samples fail to meet the DQOs a second time, or the cause of the failure cannot be identified and rectified, the data will be excluded from inclusion in the MRP results. All rejected data will be retained in the project database, and qualified as "rejected". The ultimate decision of whether to accept or reject a data point will be made by the Project Manager in consultation with the project QA Officer.

If the analysis for more than ten percent of any given analyte fails to meet the DQOs, the Project Manager and project QA Officer shall meet to discuss the appropriateness of the DQO and any potential modifications. All proposed modifications of DQOs shall be reviewed by the city of Carson.

4.2 Verification and Validation Methods

4.2.1 Data Verification and Validation Overview

Data verification is the process of evaluating the completeness, correctness, and conformance of the dataset against the method, procedural, or contractual requirements. Data validation evaluates whether the data quality goals established during the planning phase have been achieved. Data quality indicators will be continuously monitored by the analyst producing the data (field and lab personnel), as well as the Reporting and Laboratory Coordinator and Field Monitoring Coordinator, with assistance from the QA Officer, throughout the project to make sure corrective actions are taken in a timely manner. Data validation is an analyte- and sample-specific process that extends verification to determine the analytical quality of the dataset. Laboratory and field personnel responsible for conducting QA analysis will be responsible for documenting when data does not meet measurement quality objectives as determined by data quality indicators.

4.2.2 Data Verification and Validation Responsibilities

In coordination with the QA Officer, the Field Monitoring Coordinator will validate and verify field measurements and activities (sample collection and handling) and the Reporting and Laboratory Coordinator will validate and verify laboratory analysis (sample analysis and handling). Following sample delivery, the laboratory will maintain COCs and sample manifests. Laboratory validation and verification of the data generated is the responsibility of the laboratory. The laboratory supervisor maintains analytical reports in a database format as well as all QA/QC documentation for the laboratory. The Laboratory QA Officer will perform checks of all of its records.

The Reporting and Laboratory Coordinator and Field Monitoring Coordinator are responsible for oversight of data collection and the initial analysis of the raw data obtained from the field and the contracted laboratory. All data records will be checked visually and recorded as checked by initials and dates. Reconciliation and correction of any data that fails to meet the DQOs will be done by the responsible

coordinator in consultation with the project QA Officer and the Project Manager. Any corrections require a unanimous agreement that the correction is appropriate.

4.2.3 Process for Data Verification and Validation

Data verification and validation for field sample collection and handling activities will consist of the following tasks:

- Verification that the sampling activities, sample locations, number of samples collected, and type of analysis performed is in accordance with QAPP requirements.
- Documentation of any field changes or discrepancies.
- Verification that the field activities (including sample location, sample type, sample date and time, name of field personnel. etc) were properly documented.
- Verification of proper completion of sample labels and COCs forms, and secure storage of samples.

Data verification and validation for the laboratory sample analysis and handling activities will include the following tasks:

- Verification that all samples recorded on COCs forms were received by the laboratory.
- Verification that the appropriate analytical methodology has been followed.
- Verification that QC samples meet performance criteria.
- Verification that analytical results and documentation are complete.

Verification and validation of data entry includes:

- Sorting data to identify missing or mistyped (too large or too small) values.
- Double-checking all typed values.
- Data is entered in the proper format for each database fields (i.e., text for text, integers for integers, number for numbers, dates for dates, times for times, etc.).

4.3 Reconciliation with User Requirements

The dry- and wet-weather monitoring data produced by this project will be used by the end-user (CWE) to generate annual water quality monitoring reports. The limitations and assumption of the data will be provided to the end-user to allow the user to determine the data's usefulness. Data will be qualified in the project database to identify any data considered suspect, rejected or estimated.

The draft and final annual water quality monitoring reports produced by the end-user will evaluate the baseline and progress of pollutant load reductions and improvements in water quality to measure compliance with the Machado Lake Nutrient TMDL and interim and final WLAs.

Appendix A

SWAMP Requirements – Information for Completing Element 7 (Quality Objectives and Criteria for Measurement Data)

Table A-1 Data Quality Indicators and Measurement Quality Objectives – Conventional Analytes in Water	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25% (N/A if native concentration of either sample < RL)
Accuracy	80-120%
Representativeness	Laboratory sample replicates per 20 samples or analytical batch (whichever is more frequent); Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-2 Data Quality Indicators and Measurement Quality Objectives – Conventional Analytes in Water –Solids	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25% (N/A if native concentration of either sample < RL)
Accuracy	N/A
Representativeness	Laboratory sample replicates per 20 samples or analytical batch (whichever is more frequent); Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-3 Data Quality Indicators and Measurement Quality Objectives – Conventional Analytes in Water –Pathogens	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25% (N/A if native concentration of either sample < RL)
Accuracy	Positive control and reference material = 80-120% recovery Negative control = no growth on filter
Representativeness	Laboratory sample replicates per 20 samples or analytical batch (whichever is more frequent); Field duplicate 5% of total project sample count (coliforms: one per 25 tube dilution tests)
Completeness	90%
Comparability	N/A
Sensitivity	Check temperatures in incubators twice daily with a minimum of 4 hours between each reading, other calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-4 Data Quality Indicators and Measurement Quality Objectives – Conventional Analytes in Sediment	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25% (N/A if native concentration of either sample < RL)
Accuracy	80-120% recovery
Representativeness	Laboratory duplicate one per analytical batch; Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-5 Data Quality Indicators and Measurement Quality Objectives – Inorganic Analytes in Water, Sediment, and Tissue	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25% (N/A if native concentration of either sample < RL)
Accuracy	75-125% recovery (70-130% for MMHg)
Representativeness	Laboratory sample replicates per 20 samples or analytical batch (whichever is more frequent); Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-6 Data Quality Indicators and Measurement Quality Objectives – Volatile Organic Compounds in Water and Sediment	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25%
Accuracy	Reference materials: 70-130% recovery if certified, otherwise 50-150% recovery; Matrix spikes: 50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries
Representativeness	Laboratory sample replicates per 20 samples or analytical batch (whichever is more frequent); Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-7 Data Quality Indicators and Measurement Quality Objectives – Semi-Volatile Organic Compounds in Water and Sediment	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	RPD < 25%
Accuracy	Reference materials: 70-130% recovery if certified, otherwise 50-150% recovery; Matrix spikes: 50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries
Representativeness	Laboratory duplicate per method; Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-8 Data Quality Indicators and Measurement Quality Objectives – Synthetic Organic Compounds in Water, Sediment and Tissue	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	Water: RPD<25% (n/a if native concentration of either sample<RL) Sediment: Per method Tissue: Per method
Accuracy	Reference materials: 70-130% recovery if certified, otherwise 50-150% recovery; Matrix spikes: 50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries
Representativeness	Laboratory duplicate per method; Field duplicate 5% of total project sample count
Completeness	90%
Comparability	N/A
Sensitivity	Calibration per analytical method or manufacturer's specifications. Refer to Appendix C for reporting limits.

Table A-9 Data Quality Indicators and Measurement Quality Objectives – Toxicity Testing (General)	
Data Quality Indicator	**SWAMP Required Measurement Quality Objectives**
Precision	Per method requirements
Accuracy	Laboratory Control Water and Sediment Control must meet all test acceptability criteria (Please refer to Section 7 of the EPA manuals) for the species of interest.
Representativeness	Refer to Appendix E for required test conditions; field duplicates are required at 5% of total project sample count.
Completeness	90%
Comparability	Reference Toxicant Tests must be conducted monthly for species that are raised within a laboratory (i.e. positive controls). Reference Toxicant Test must be conducted per analytical batch for species from commercial supplier settings. Reference Toxicant Tests must be conducted concurrently for test species or broodstocks that are field collected. Last plotted data point must be within 2 SD of the cumulative mean (n=20). (Reference toxicant tests that fall outside of recommended control chart limits are evaluated to determine the validity of associated effluent and receiving water tests. An out of control reference toxicant test result does not necessarily invalidate associated test results. More frequent and/or concurrent reference toxicant testing may be advantageous if recent problems have been identified in testing.)
Sensitivity	Refer to Appendix E for specific sensitivity requirements.

In special cases where the criteria listed in the following tables cannot be met, EPA minimum criteria may be followed. The affected data should be qualified accordingly.

Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

Table A-10 Data Quality Indicators and Measurement Quality Objectives – Field Measurements**

Water Quality Parameter	Recommended Device	Units	Resolution	"Electronic Specs" Accuracy**
Depth	Stadia Rod/Staff Gauge	m	0.01	N/A
Dissolved Oxygen	Polarographic or Luminescence Quenching	mg/L	0.1	± 0.2
pH	Electrode	None	0.1	± 0.2
Salinity	Refractometer or Conductivity Cell	%	2	± 2
Specific Conductivity	Conductivity Cell	µS/cm	1	± 2
Temperature	Thermistor or Bulb	°C	0.1 or 0.5	± 0.1
Total Chlorophyll	Optical Fluorescence Chlorophyll Probe	µg/L	0.1	N/A
Turbidity	Portable Turbidimeter or Optical Probe	NTU	1	± 1
Velocity	Flow Meter	ft/s	0.05	Follow manufacturer's instructions

** This table may not include all field analyses. Please refer to method or manufacturer instructions for guidance. Refer to Appendix C for reporting limits.

Appendix B

SWAMP Requirements and Recommendations – Information for Completing Element 11 (Sampling Methods) and Element 12 (Sample Handling and Custody)

Table B-1 Sampling and Preservation - Conventionals in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Alkalinity (as $CaCO_3$)	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	14 days
Ammonia (as N)	mg/L	Polyethylene Bottles	500 mL	Cool to 6 °C and store in the dark. Samples may be preserved with 2 mL of $H2SO_4$ per L	48 hours; 28 days if acidified
Biochemical Oxygen Demand	mg/L	4-L cubitainer	4000 mL	Add 1 g FAS crystals per liter if residual Cl present; Cool to 6 °C and store in the dark	48 hours
Boron	mg/L	Polyethylene Bottles. Only plastic apparatus should be used when the determinations of boron and silica are critical.	600 mL	Acidify with (1+1) HNO_3 to pH <2	6 months
Calcium	mg/L	Polyethylene Bottles. Glass or plastic filtering apparatus are recommended to avoid possible contamination.	600 mL	Acidify with (1+1) HNO_3 to pH <2	6 months

Table B-1 Sampling and Preservation - Conventionals in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Chemical Oxygen Demand (Titrametric)	mg/L	1-L cubitainer Collect the samples in glass bottles, if possible. Use of plastic containers is permissible if it is known that no organic contaminants are present in the containers.	1000 mL	Preserve to pH <2 with ~2 mL of conc. H_2SO_4; Cool to 6 °C and store in the dark	28 days Biologically active samples should be tested as soon as possible. Samples containing settleable material must be well mixed, preferably homogenized, to permit removal of representative aliquots.
Chloride	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	28 days
Chlorophyll a Pheophytin a	µg/L	Please refer to method requirements	500 mL	Centrifuge or filter as soon as possible after collection. If processing must be delayed, hold samples on ice or at 6 °C and store in the dark.	Samples must be frozen or analyzed within 4 hours of collection. Filters can be stored frozen for 28 days.
Cyanide	mg/L	1-L cubitainer	1000 mL	Preserve to pH>12 with ~ 2 mL 1:1 NaOH, Add 0.6 g $C_6H_8O_6$ if residual Cl present; Cool to 6 °C and store in the dark	14 days
Fluoride	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	28 days

Table B-1 Sampling and Preservation - Conventionals in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Hardness (as $CaCO_3$)	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark. Acidify with HNO_3 to pH<2	6 months
Iron	mg/L	Please refer to method requirements	600 mL	Cool to 6 °C and acidify with (1+1) HNO_3 to pH <2	6 months
Kjeldahl Nitrogen (Total)	mg/L	Polyethylene Bottles	600 mL	Cool to 6 °C and store in the dark. Acidify with H_2SO_4 to pH<2	7 days or 28 days if acidified
Magnesium	mg/L	Polyethylene Bottles. Glass or plastic filtering apparatus are recommended to avoid possible contamination.	600 mL	Acidify with (1+1) HNO_3 to pH <2	6 months
Nitrate (as N)	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	48 hours unless calculated from nitrate + nitrite (as N) and nitrite (as N) analyses
Nitrate + Nitrite (as N)	mg/L	Polyethylene Bottles	150 mL	Cool to 6 °C and store in the dark. Acidify with H_2SO_4 to pH<2	48 hours or 28 days if acidified
Nitrite (as N)	mg/L	Polyethylene Bottles	150 mL	Cool to 6 °C and store in the dark	48 hours
Oil and Grease (HEM)	mg/L	1-L glass jar (w/Teflon lined lid and rinsed with hexane or methylene chloride)	1000 mL	Preserve to pH <2 with ~2 mL of conc. H_2SO_4 Cool to 6 °C and store in the dark	28 days

Table B-1 Sampling and Preservation - Conventionals in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Organic Carbon (Total)	mg/L	40-mL glass vial	40 mL	Cool to 6 °C and store in the dark. If analysis is to occur more than two hours after sampling, acidify (pH < 2) with HCl or H_2SO_4.	28 days
Organic Carbon (Dissolved)	mg/L	40-mL glass vial	40 mL	Cool to 6 °C and store in the dark	28 days
Orthophosphate (Total, as P)	mg/L	Polyethylene Bottles	150 mL	Cool to 6 °C and store in the dark	48 hours
Orthophosphate (Dissolved, as P) ***Soluble Reactive Phosphorus***	mg/L	Polyethylene Bottles	150 mL	Filter within 15 minutes of collection; Cool to 6 °C and store in the dark	48 hours
Perchlorate	µg/L	Plastic or glass	300 mL	Protect from temperature extremes	28 days
Phenols	mg/L	1-L glass jar w/ Teflon lined lid	1000 mL	Preserve to pH <2 with ~2 mL of concentrated H_2SO_4; Cool to 6 °C and store in the dark	Samples must be extracted within 7 days of collection, and analyzed within 28 days of extraction.
Phosphorus (Total, as P)	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	28 days
Phosphorus (Dissolved, as P)	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	28 days

Table B-1 Sampling and Preservation - Conventionals in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Potassium	mg/L	Polyethylene Bottles	600 mL	Acidify with (1+1) HNO_3 to pH <2	6 months
Silica	mg/L	Only plastic apparatus should be used when the determinations of boron and silica are critical.	300 mL	Acidify with (1+1) HNO_3 to pH <2.	6 months
Specific Conductivity	µS/cm	Polyethylene Bottles	500 mL	Cool to 6 °C and store in the dark If analysis is not completed within 24 hours of sample collection, sample should be filtered through a 0.45 micron filter and stored in the dark at 6 °C.	28 days
Sulfate	mg/L	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	28 days
Sodium	mg/L	Polyethylene Bottles. Glass or plastic filtering apparatus are recommended to avoid possible contamination.	600 mL	Acidify with (1+1) HNO_3 to pH <2.	6 months
Turbidity	NTU	Polyethylene Bottles	300 mL	Cool to 6 °C and store in the dark	48 hours

Table B-2 Sampling and Preservation – Conventionals in Water – Solids					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Fixed & Volatile Dissolved Solids (500-550 ˚C)	mg/L	Please refer to method.	None Specified	Refrigeration or icing to 6°C, to minimize microbiological decomposition of solids is recommended.	24 hours, maximum 7 days
Suspended Sediment Concentration	mg/L	125-mL amber glass jar or Polyethylene Bottles*	125 mL	Cool to 6 ˚C and store in the dark	7 days
Total Dissolved Solids	mg/L	Polyethylene Bottles*	1000 mL	Cool to 6 ˚C and store in the dark	7 days
Total Suspended Solids (103-105 ˚C)	mg/L	500-mL amber glass jar or Polyethylene Bottles*	1000 mL	Refrigeration or icing to 6°C, to minimize microbiological decomposition of solids, is recommended.	7 days
Volatile Suspended Solids	mg/L	Please refer to method.	None Specified	Refrigeration or icing to 6°C, to minimize microbiological decomposition of solids is recommended.	Analysis must begin as soon as possible.

Table B-3 Sampling and Preservation – Conventionals in Water - Pathogens					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
E. Coli	MPN/100 mL	Factory-sealed, pre-sterilized, disposable Whirlpak bags or 125 mL sterile plastic (high density polyethylene or polypropylene) container	100 mL	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6 ˚C in the dark.	24 hours (6 hours for regulatory data)
Enterococcus	colonies/ 100 mL	Factory-sealed, pre-sterilized, disposable Whirlpak bags or 125 mL sterile plastic (high density polyethylene or polypropylene) container	100 mL	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6 ˚C in the dark.	24 hours (6 hours for regulatory data)
Fecal Coliform	MPN/100 mL	Factory-sealed, pre-sterilized, disposable Whirlpak bags or 125 mL sterile plastic (high density polyethylene or polypropylene) container	100 mL	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6 ˚C in the dark.	24 hours (6 hours for regulatory data)
Total Coliform	MPN/100 mL	Factory-sealed, pre-sterilized, disposable Whirlpak bags or 125 mL sterile plastic (high density polyethylene or polypropylene) container	100 mL	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6 ˚C in the dark.	24 hours (6 hours for regulatory data)

Table B-3 Sampling and Preservation – Conventionals in Water - Pathogens					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Streptococcus	MPN/100 mL	Factory-sealed, pre-sterilized, disposable Whirlpak bags or 125 mL sterile plastic (high density polyethylene or polypropylene) container	100 mL	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6 °C in the dark.	24 hours (6 hours for regulatory data)

Table B-4 Sampling and Preservation – Conventionals in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Sediment Grain Size Analysis	% fines, gravel, sand, silt, and clay (Wentworth scale)	125-mL clear glass jar; pre-cleaned**	125 mL	Cool to 6 °C in the dark up to 28 days. Do not freeze	Please refer to method
Sediment Total Organic Carbon	%OC (dry weight)	125-mL clear glass jar; pre-cleaned*	125 mL	Cool to 6 °C in the dark up to 28 days**	Please refer to method
Moisture	%	125-mL to 250-mL clear glass jar; pre-cleaned*	200 g***	Please refer to the method associated with the target analyte or parameter	Please refer to the method associated with the target analyte or parameter

* Sediment samples for TOC and grain size analysis can be combined in one 250-mL clear glass jar, and sub-sampled at the laboratory in order to utilize holding time differences for the two analyses. If this is done, the 250 mL combined sediment sample must be refrigerated only (not frozen) at 6 °C for up to 28 days, during which time the sub-samples must be aliquoted in order to comply with separate storage requirements (as shown above).

** Sediment samples for sediment TOC analysis can be held at 6 °C for up to 28 days, and must be analyzed within this 28 day period, but can be frozen at any time during the initial 28 days, for up to 1 year maximum at -20 °C.

*** Split taken from sample for chemistry analyses

Table B-5 Sampling and Preservation – Conventionals in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume***	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Moisture	%	125-mL to 250-mL clear glass jar; pre-cleaned**	200 g	Please refer to the method associated with the target analyte	Please refer to the method associated with the target analyte
Lipids	%	125-mL to 250-mL clear glass jar; pre-cleaned**	200 g	Please refer to the method associated with the target analyte	Please refer to the method associated with the target analyte

* Split taken from sample for chemistry analyses.

Table B-6 Sampling and Preservation – Inorganic Analytes in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aluminum Arsenic Cadmium Chromium Copper Lead Manganese Nickel Selenium Silver Zinc (Total)	µg/L	60-mL acid-cleaned polyethylene bottle	60 mL	Cool to 6 ◦C in the dark; Acidify to pH<2 with pre-tested HNO_3 within 48 hours	6 months at room temperature following acidification
Aluminum Arsenic Cadmium Chromium Copper Lead Manganese Nickel Selenium Silver Zinc (Dissolved)	µg/L	60-mL acid-cleaned polyethylene bottle	60 mL	Filter within 15 minutes of collection; Cool to 6 ◦C in the dark; Acidify to pH<2 with pre-tested HNO_3 within 48 hours	6 months at room temperature after filtration and/or acidification

Table B-6 Sampling and Preservation – Inorganic Analytes in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Mercury (Total)	ng/L	250-mL glass or acid-cleaned Teflon bottle	250 mL	Cool to 6 ◦C in the dark; Acidify to 0.5% with pre-tested HCl within 48 hours	6 months at room temperature following acidification
Mercury (Dissolved)	ng/L	250-mL glass or acid-cleaned Teflon bottle	250 mL	Filter within 15 minutes of collection; Cool to 6 ◦C in the dark; Acidify to 0.5% with pre-tested HCl within 48 hours	6 months at room temperature after filtration and/or acidification
Methylmercury (Total)	ng/L	250-mL glass or acid-cleaned Teflon bottle	250 mL	Cool to 6 ◦C in the dark; Acidify to 0.5% with pre-tested HCl within 48 hours; If salinity is >0.5 ppt, acidify with H_2SO_4	6 months at room temperature following acidification
Methylmercury (Dissolved)	ng/L	250-mL glass or acid-cleaned Teflon bottle	250 mL	Cool to 6 ◦C in the dark; Filter and acidify to 0.5% with pre-tested HCl within 48 hours. If salinity is >0.5 ppt, acidify with H_2SO_4	6 months at room temperature after filtration and/or acidification
Hexavalent Chromium (Filtered)	µg/L	600-mL polyethylene or glass bottle	600 mL	Cool to 6 ◦C in the dark	24 hours, must notify lab in advance

Table B-7 Sampling and Preservation – Inorganic Analytes in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aluminum **Arsenic** **Cadmium** **Chromium** **Copper** **Lead** **Manganese** **Mercury** **Nickel** **Selenium** **Silver** **Zinc**	mg/kg	60-mL I-Chem 300 or 200 series clear glass jar with Teflon lid-liner	100 g	Cool to 6 ˚C and in the dark	1 year at -20 ˚C; Samples must be analyzed within 14 days of collection or thawing.
Methylmercury	mg/kg	60-mL I-Chem 300 or 200 series clear glass jar with Teflon lid-liner	100 g	Freeze to ≤-20 °C immediately	1 year

Table B-8 Sampling and Preservation – Inorganic Analytes in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation***	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aluminum **Arsenic** **Cadmium** **Chromium** **Copper** **Lead** **Manganese** **Nickel** **Selenium** **Silver** **Zinc**	µg/g	Polyethylene bags, Teflon sheets in Ziplock bags, or I-Chem 300 or 200 series clear glass jars with Teflon lined lids; acid-cleaned polyethylene jars if only sampling for trace metals	20-50 g	Cool to 6 °C within 24 hours, then freeze to ≤-20 °C	1 year at -20 °C;
Mercury	µg/g	Teflon sheets in Ziplock bags, or glass jars with Teflon lined lids	20-50 g	Cool to 6 °C within 24 hours, then freeze to ≤-20 °C	1 year at -20 °C;

Table B-8 Sampling and Preservation – Inorganic Analytes in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation***	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Methylmercury	µg/g	Teflon sheets in Ziplock bags, or glass jars with Teflon lined lids	20-50 g	Cool to 6 °C within 24 hours, then freeze to ≤-20 °C	1 year at -20 °C;

* Fish to be reported in wet weight; all other tissues to be reported in dry weight.

Table B-9 Sampling and Preservation – Volatile Organic Compounds in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
1,1-Dichloroethane **1,1-Dichloroethylene** **1,1-Dichloropropene** **1,1,1-Trichloroethane** **1,1,2-Trichloroethane** **1,1,1,2-Tetrachloroethane** **1,1,2,2-Tetrachloroethane** **1,2-Dibromo-3-chloropropane (DBCP)** **1,2-Dibromoethane** **1,2-Dichlorobenzene** **1,2-Dichloroethane** **1,2-Dichloropropane** **1,2-cis-Dichloroethylene** **1,2-trans-Dichloroethylene** **1,2,3-Trichlorobenzene** **1,2,3-Trichloropropane** **1,2,4-Trichlorobenzene** **1,2,4-Trimethylbenzene** **1,3-Dichlorobenzene** **1,3-Dichloropropane** **1,3,5-Trimethylbenzene** **1,4-Dichlorobenzene** **2-Chlorotoluene** **2,2-Dichloropropane** **4-Chlorotoluene** **Benzene** **Bromobenzene** **Bromochloromethane** **Bromodichloromethane** **Bromoform** **Carbon tetrachloride** **Chlorobenzene** **Chloroform** **Dibromochloromethane** **Dibromomethane** **Ethylbenzene** **Fluorobenzene** **Hexachlorobutadiene** **Isopropylbenzene** **Methyl tert-butyl ether (MTBE)** **m/p-Xylene** **Naphthalene** **n-Butylbenzene** **n-Propylbenzene** **o-Xylene** **p-Isopropyltoluene** **sec-Butylbenzene** **tert-Butylbenzene** **Tetrachloroethylene** **Toluene** **Trichloroethylene** **Total Xylene**	ug/L	40-mL VOA vials	120 mL (three VOA vials)	All vials are pre-acidified (50% HCl or H_2SO_4) at lab before sampling. Cool to 6 °C in the dark.	14 days at 6 °C, dark, and pH< 2; 7 days at 6 °C, dark, for non-acidified
Recommended Surrogate (% Recovery)					
4-Bromofluorobenzene, Chlorobenzene-d5, Dibromofluoromethane, Toluene-d8					

Table B-10 Sampling and Preservation – Volatile Organic Compounds in Sediment

Analyte	Units	Recommended Container	Recommended Sample Mass	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
1,1-Dichloroethane **1,1-Dichloroethylene** **1,1-Dichloropropene** **1,1,1-Trichloroethane** **1,1,1,2-Tetrachloroethane** **1,1,2-Trichloroethane** **1,1,2,2-Tetrachloroethane** **1,2-Dibromo-3-chloropropane, (DBCP)** **1,2-Dibromomethane** **1,2-Dichlorobenzene** **1,2-Dichloroethane** **1,2-Dichloropropane** **1,2-cis-Dichloroethylene** **1,2-trans-Dichloroethylene** **1,2,3-Trichlorobenzene** **1,2,3-Trichloropropane** **1,2,4-Trichlorobenzene** **1,2,4-Trimethylbenzene** **1,3-Dichlorobenzene** **1,3-Dichloropropane** **1,3,5-Trimethylbenzene** **1,4-Dichlorobenzene** **2-Chlorotoluene** **2,2-Dichloropropane** **4-Chlorotoluene** **Benzene** **Bromobenzene** **Bromochloromethane** **Bromodichloromethane** **Bromoform** **Carbon tetrachloride** **Chlorobenzene** **Chloroform** **Dibromochloromethane** **Dibromomethane** **Ethylbenzene** **Fluorobenzene** **Hexachlorobutadiene** **Isopropylbenzene** **Methyl tert-butyl ether (MTBE)** **m/p-Xylene** **n-Butylbenzene** **n-Propylbenzene** **Naphthalene** **o-Xylene** **p-Isopropyltoluene** **sec-Butylbenzene** **tert-Butylbenzene** **Tetrachloroethylene** **Toluene** **Trichloroethylene** **Total Xylene**	ng/g	250-mL I-Chem 300-series amber glass jar with Teflon lid-liner; Pre-cleaned.	200 g	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be analyzed within 14 days of collection or thawing.
Recommended Surrogates (% Recovery)					
1,2-Dichloromethane-d4, 4-Bromofluorobenzene, Chlorobenzene-d5, Dibromofluoromethane, Toluene-d8					

Table B-11 Sampling and Preservation – Semi-Volatile Organic Compounds* in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
1,2-Dichlorobenzene **1,2,4-Trichlorobenzene** **1,4-Dichlorobenzene** **2-Chloronaphthalene** **2-Chlorophenol** **2-Methylnaphthalene** **2-Methylphenol** **2-Nitroaniline** **2-Nitrophenol** **2,4-Dichlorophenol** **2,4-Dimethylphenol** **2,4-Dinitrophenol** **2,4-Dinitrotoluene** **2,4,5-Trichlorophenol** **2,4,6-Trichlorophenol** **2,6-Dinitrotoluene** **3-Nitroaniline** **3,4-Methylphenol** **4-Bromophenylphenylether** **4-Chloro-3-methylphenol** **4-Chloroaniline** **4-Chlorophenyl phenyl ether** **4-Nitroaniline** **4-Nitrophenol** **4,6-Dinitro-2-methylphenol** **Bis(2-chloroethoxy)methane** **Bis(2-chloroethyl) ether** **Bis(2-ethylhexyl) phthalate** **Butyl benzyl phthalate** **Carbazole** **Dibenzofuran** **Diethyl phthalate** **Dimethyl phthalate** **Di-n-butyl phthalate** **Di-n-octyl phthalate** **Hexachlorobenzene** **Hexachlorobutadiene** **Hexachlorocyclopentadiene** **Hexachloroethane** **Isophorone** **Nitrobenzene** **n-Nitrosodi-n-propylamine** **Pentachlorophenol** **Phenol** **Total Xylenes**	µg/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL (Each sample type requires a separate 1000-mL container)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogate (% Recovery)					
2-Fluorobiphenyl, 2-Fluorophenol, 2,4,6-Tribromophenol, Nitrobenzene-d5, Phenol-d6, Terphenyl-d14					

* Information on Polynuclear Aromatic Hydrocarbons may be found in Table 2-16.

Table B-12 Sampling and Preservation – Semi-Volatile Organic Compounds in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
1,2-Dichlorobenzene **1,4-Dichlorobenzene** **1,2,4-Trichlorobenzene** **2-Chloronaphthalene** **2-Chlorophenol** **2-Nitroaniline** **2-Nitrophenol** **2,4-Dichlorophenol** **2,4-Dimethylphenol** **2,4-Dinitrophenol** **2,4-Dinitrotoluene** **2,4,5-Trichlorophenol** **2,4,6-Trichlorophenol** **2,6-Dinitrotoluene** **3-Nitroaniline** **4-Bromophenyl phenyl ether** **4-Chloro-3-methylphenol** **4-Chloroaniline** **4-Chlorophenyl phenyl ether** **4-Nitroaniline** **4,6-Dinitro-2-methylphenol** **Acenaphthene** **Acenaphthylene** **Anthracene** **Benz[a]anthracene** **Benzo[a]pyrene** **Benzo[b]fluoranthene** **Benzo[g,h,i]perylene** **Benzo[k]fluoranthene** **Bis(2-chloroethoxy)methane** **Bis(2-chloroethyl) ether** **Bis(2-chloroisopropyl)ether** **Bis(2-ethylhexyl) phthalate** **Carbazole** **Chrysene** **Dibenzofuran** **Diethyl phthalate** **Dimethyl phthalate** **Di-n-butyl phthalate** **Naphthalene** **Nitrobenzene** **n-Nitrosodi-n-propylamine** **Pentachlorophenol** **Phenanthrene** **Phenol** **Pyrene** **Total Xylenes**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	200 g	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
2-Fluorobiphenyl, 2-Fluorophenol, 2,4,6-Tribromophenol, Nitrobenzene-d5, Phenol-d6, Terphenyl-d14					

Table B-13 Sampling and Preservation – Synthetic Organic Compounds (Polychlorinated Biphenyls as Congeners/Aroclor) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
PCB 5 **PCB 8** **PCB 15** **PCB 18** **PCB 27** **PCB 28** **PCB 29** **PCB 31** **PCB 33** **PCB 44** **PCB 49** **PCB 52** **PCB 56** **PCB 60** **PCB 66** **PCB 70** **PCB 74** **PCB 87** **PCB 137** **PCB 138** **PCB 141** **PCB 149** **PCB 151** **PCB 153** **PCB 156** **PCB 157** **PCB 158** **PCB 170** **PCB 174** **PCB 177** **PCB 180** **PCB 183** **PCB 187** **PCB 189** **PCB 194** **PCB 195** **PCB 200** **PCB 201** **PCB 203** **PCB 206** **PCB 209** **Aroclor 1248** **Aroclor 1254** **Aroclor 1260**	µg/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
PCB 209					

Table B-14 Sampling and Preservation – Synthetic Organic Compounds (Polychlorinated Biphenyls as Congeners/Aroclor) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
PCB 8 **PCB 18** **PCB 27** **PCB 28** **PCB 29** **PCB 31** **PCB 33** **PCB 44** **PCB 49** **PCB 52** **PCB 56** **PCB 60** **PCB 66** **PCB 70** **PCB 74** **PCB 87** **PCB 95** **PCB 97** **PCB 99** **PCB 101** **PCB 105** **PCB 110** **PCB 114** **PCB 118** **PCB 128** **PCB 137** **PCB 138** **PCB 141** **PCB 149** **PCB 151** **PCB 153** **PCB 156** **PCB 157** **PCB 158** **PCB 170** **PCB 174** **PCB 177** **PCB 180** **PCB 183** **PCB 187** **PCB 189** **PCB 194** **PCB 195** **PCB 200** **PCB 201** **PCB 203** **PCB 206** **PCB 209** **Aroclor 1248** **Aroclor 1254** **Aroclor 1260**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
PCB 207					

Table B-15 Sampling and Preservation – Synthetic Organic Compounds (Polychlorinated Biphenyl Congeners/Aroclor) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
PCB 8 **PCB 18** **PCB 27** **PCB 28** **PCB 29** **PCB 31** **PCB 33** **PCB 44** **PCB 49** **PCB 52** **PCB 56** **PCB 60** **PCB 66** **PCB 70** **PCB 74** **PCB 87** **PCB 95** **PCB 97** **PCB 99** **PCB 101** **PCB 105** **PCB 110** **PCB 114** **PCB 118** **PCB 128** **PCB 137** **PCB 138** **PCB 141** **PCB 149** **PCB 151** **PCB 153** **PCB 156** **PCB 157** **PCB 158** **PCB 170** **PCB 174** **PCB 177** **PCB 180** **PCB 183** **PCB 187** **PCB 189** **PCB 194** **PCB 195** **PCB 200** **PCB 201** **PCB 203** **PCB 206** **PCB 209** **Arochlor 1248** **Arochlor 1254** **Arochlor 1260**	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
PCB 207					

Table B-16 Sampling and Preservation – Synthetic Organic Compounds (Polynuclear Aromatic Hydrocarbons) in Water

Analyte	Units	Recommended Container	Recommended Sample Volume	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
1-Methylfluorene **1-Methylnaphthalene** **1-Methylphenanthrene** **2-Methylfluoranthene** **2-Methylnaphthalene** **2,3,5-Trimethylnaphthalene** **2,6-Dimethylnaphthalene** **3,6-Dimethylphenanthrene** **4-Methyldibenzothiophene** **Acenaphthene** **Acenaphthylene** **Anthracene** **Benz(a)anthracene** **Benzo(a)pyrene** **Benzo(b)fluoranthene** **Benzo(e)pyrene** **Benzo(g,h,i)perylene** **Benzo(k)fluoranthene** **Biphenyl** **C1-Chrysenes** **C1-Dibenzothiophenes** **C1-Fluorenes** **C1-Fluoranthene/ Pyrenes** **C1-Naphthalenes** **C1-Phenanthrene/ Anthracene** **C2-Chrysenes** **C2-Dibenzothiophenes** **C2-Fluorenes** **C2-Naphthalenes** **C2-Phenanthrene/Anthracene** **C3-Chrysenes** **C3-Dibenzothiophenes** **C3-Fluorenes** **C3-Naphthalenes** **C3-Phenanthrene/ Anthracene** **C4-Naphthalenes** **C4-Phenanthrene/ Anthracene** **Chrysenes** **Dibenz(a,h)anthracene** **Dibenzothiophene** **Fluoranthene** **Fluorene** **Indeno(1,2,3-c,d)pyrene** **Naphthalene** **Perylene** **Phenanthrene** **Pyrene**	µg/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Acenaphthene-d10, Benz(a)anthracene-D12, Benzo(g,h,i)perylene-D12, Biphenyl-D10, Naphthalene-d8, Perylene-d12, Phenanthrene-d10, Pyrene-d10					

Table B-17 Sampling and Preservation – Synthetic Organic Compounds (Polynuclear Aromatic Hydrocarbons) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
1-Methylfluorene **1-Methylnaphthalene** **1-Methylphenanthrene** **2-Methylfluoranthene** **2-Methylnaphthalene** **2,3,5-Trimethylnaphthalene** **2,6-Dimethylnaphthalene** **3,6-Dimethylphenanthrene** **4-Methyldibenzothiophene** **Acenaphthene** **Acenaphthylene** **Anthracene** **Benz(a)anthracene** **Benzo(a)pyrene** **Benzo(b)fluoranthene** **Benzo(e)pyrene** **Benzo(g,h,i)perylene** **Benzo(k)fluoranthene** **Biphenyl** **Chrysene** **C1-Chrysenes** **C1-Dibenzothiophenes** **C1-Fluorenes** **C1-Fluoranthene/ Pyrenes** **C1-Naphthalenes** **C1-Phenanthrene/ Anthracene** **C2-Chrysenes** **C2-Dibenzothiophenes** **C2-Fluorenes** **C2-Naphthalenes** **C2-Phenanthrene/ Anthracene** **C3-Chrysenes** **C3-Dibenzothiophenes** **C3-Fluorenes** **C3-Naphthalenes** **C3-Phenanthrene/ Anthracene** **C4-Phenanthrene/ Anthracene** **C4-Naphthalenes** **Dibenz(a,h)anthracene** **Dibenzothiophene** **Fluoranthene** **Fluorene** **Indeno(1,2,3-c,d)pyrene** **Naphthalene** **Perylene** **Phenanthrene** **Pyrene**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Acenaphthene-d10, Benz(a)anthracene-D12, Benzo(g,h,i)perylene-D12, Biphenyl-D10, Naphthalene-d8, Perylene-d12, Phenanthrene-d10, Pyrene-d10					

Table B-18 Sampling and Preservation – Synthetic Organic Compounds (Polynuclear Aromatic Hydrocarbons) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
1-Methylfluorene **1-Methylnaphthalene** **1-Methylphenanthrene** **2-Methylfluoranthene** **2-Methylnaphthalene** **2,3,5-Trimethylnaphthalene** **2,6-Dimethylnaphthalene** **3,6-Dimethylphenanthrene** **4-Methyldibenzothiophene** **Acenaphthene** **Acenaphthylene** **Anthracene** **Benz(a)anthracene** **Benzo(a)pyrene** **Benzo(b)fluoranthene** **Benzo(e)pyrene** **Benzo(g,h,i)perylene** **Benzo(k)fluoranthene** **Biphenyl** **C1-Chrysenes** **C1-Dibenzothiophenes** **C1 Fluoranthene/ Pyrenes** **C1-Fluorenes** **C1-Naphthalenes** **C1-Phenanthrene/ Anthracene** **C2-Chrysenes** **C2-Dibenzothiophenes** **C2-Fluorenes** **C2-Naphthalenes** **C2-Phenanthrene/ Anthracene** **C3-Chrysenes** **C3-Dibenzothiophenes** **C3-Fluorenes** **C3-Naphthalenes** **C3-Phenanthrene/ Anthracene** **C4-Naphthalenes** **C4-Phenanthrene/ Anthracene** **Chrysene** **Dibenz(a,h)anthracene** **Dibenzothiophene** **Fluoranthene** **Fluorene** **Indeno(1,2,3-c,d)pyrene** **Naphthalene** **Perylene** **Phenanthrene** **Pyrene**	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Acenaphthene-d10, Benz(a)anthracene-D12, Benzo(g,h,i)perylene-D12, Biphenyl-D10, Naphthalene-d8, Perylene-d12, Phenanthrene-d10, Pyrene-d10					

Table B-19 Sampling and Preservation – Synthetic Organic Compounds (Organochlorine Pesticides) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aldrin **alpha-HCH** **cis-Chlordane** **beta-HCH** **trans-Chlordane** **Dacthal** **DDD (o,p')** **DDD (p,p')** **DDE (o,p')** **DDE (p,p')** **DDMU (p,p')** **DDT (o,p')** **DDT (p,p')** **delta-HCH** **Dieldrin** **Endosulfan I** **Endosulfan II** **Endosulfan sulfate** **Endrin** **Endrin Aldehyde** **Endrin Ketone** **gamma-HCH** **Heptachlor** **Heptachlor epoxide** **Hexachlorobenzene** **Methoxychlor** **Mirex** **cis-Nonachlor** **trans-Nonachlor** **Oxadiazon** **Oxychlordane** **Tedion** **Toxaphene**	µg/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to ≤6 °C in the dark; pH 5-9.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Dibromoocta-fluorobiphenyl					

Table B-20 Sampling and Preservation – Synthetic Organic Compounds (Organochlorine Pesticides) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aldrin **Alpha-HCH** **Beta-HCH** **cis-Chlordane** **trans-Chlordane** **Dacthal** **DDD (o,p')** **DDD (p,p')** **DDE (o,p')** **DDE (p,p')** **DDMU (p,p')** **DDT (o,p')** **DDT (p,p')** **Dieldrin** **Endosulfan I** **Endosulfan II** **Endosulfan sulfate** **Endrin** **Delta-HCH** **Gamma-HCH** **Heptachlor** **Heptachlor epoxide** **Hexachlorobenzene** **Methoxychlor** **Mirex** **Nonachlor, cis** **Nonachlor, trans** **Oxadiazon** **Oxychlordane** **Tedion** **Toxaphene**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
PCB 207, Dibromooctafluorobiphenyl, DDD (p,p'), DBCE					

Table B-21 Sampling and Preservation – Synthetic Organic Compounds (Organochlorine Pesticides) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aldrin **Alpha-HCH** **Beta-HCH** **cis-Chlordane** **trans-Chlordane** **Dacthal** **DDD (o,p')** **DDD (p,p')** **DDE (o,p')** **DDE (p,p')** **DDMU (p,p')** **DDT (o,p')** **DDT (p,p')** **Dieldrin** **Endosulfan I** **Endosulfan II** **Endosulfan sulfate** **Endosulfan sulfate** **Endrin** **Gamma-HCH** **Heptachlor** **Heptachlor epoxide** **Hexachlorobenzene** **Methoxychlor** **Mirex** **cis-Nonachlor** **trans-Nonachlor** **Oxadiazon** **Oxychlordane** **Tedion** **Toxaphene**	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
PCB 207, Dibromoocta fluorobiphenyl, DDD (p,p'), DBCE					

Table B-22 Sampling and Preservation – Synthetic Organic Compounds (Wastewater Organochlorine Pesticides) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Chlorothalonil PCNB	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to ≤6 °C in the dark; pH 5-9.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.

Table B-23 Sampling and Preservation – Synthetic Organic Compounds (Wastewater Organochlorine Pesticides) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Chlorothalonil	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
PCNB	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.

Table B-24 Sampling and Preservation – Synthetic Organic Compounds (Organophosphate Pesticides) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aspon **Azinphos ethyl** **Carbophenothion** **Chlorfenvinphos** **Chlorpyrifos** **Chlorpyrifos methyl** **Ciodrin** **Coumaphos** **Demeton-S** **Diazinon** **Naled** **Dichlofenthion** **Dichlorvos** **Dicrotophos** **Dimethoate** **Dioxathion** **Disulfoton** **Ethion** **Famphur** **Fenchlorophos** **Fenitrothion** **Fensulfothion** **Fenthion** **Fonofos** **Azinphos methyl** **Leptophos** **Malathion** **Methidathion** **Parathion, ethyl** **Parathion, methyl** **Molinate** **Phorate** **Mevinphos** **Phosmet** **Phosphamidon** **Ethoprop** **Sulfotep** **Bolstar** **Terbufos** **Tetrachlorvinphos** **Thiobencarb** **Thionazin** **Tokuthion** **Merphos** **Trichlorfon** **Trichloronate**	µg/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to ≤6 °C in the dark; pH 5-9.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Triphenyl phosphate					

Table B-25 Sampling and Preservation – Synthetic Organic Compounds (Organophosphate Pesticides) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Chlorpyrifos **Chlorpyrifos methyl** **Diazinon** **Dichlofenthion** **Dieldrin** **Dioxathion** **Ethion** **Fecnchlorphos** **Fenitrothion** **Fonofos** **Malathion** **Parathion, ethyl** **Parathion, methyl** **Phosphamidon** **Ethoprop** **Sulfotep** **Thionzion** **Tokuthion** **Merphos** **Trichloronate**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Triphenyl phosphate					

Table B-26 Sampling and Preservation – Synthetic Organic Compounds (Organophosphate Pesticides) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Chlorpyrifos **Chlorpyrifos methyl** **Diazinon** **Dichlofenthion** **Dioxathion** **Ethion** **Fenchchlorphos** **Fenitrothion** **Fenofos** **Malathion** **Parathion, Ethyl** **Parathion, Methyl** **Phosphamidon** **Ethoprop** **Sulfotep** **Thionazin** **Tokuthion** **Merphos** **Trichloronate**	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Triphenyl phosphate					

Table B-27 Sampling and Preservation – Synthetic Organic Compounds (Diesel Range Organics) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Diesel Range Organics	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
σ - Terphenyl					

Table B-28 Sampling and Preservation – Synthetic Organic Compounds (Diesel Range Organics) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Diesel Range Organics	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Σ - Terphenyl					

Table B-29 Sampling and Preservation – Synthetic Organic Compounds (Pyrethroids/Pyrethrins) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Bifenthrin **Cyfluthrin, Total** **Cypermethrin, Total** **Deltamethrin** **Esfenvalerate/ Fenvalerate, Total** **lambda-Cyhalothrin, Total** **cis-Permethrin** **trans-Permethrin**	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction .
Recommended Surrogates (% Recovery)					
Dibromoocta-fluorobiphenyl					

Table B-30 Sampling and Preservation – Synthetic Organic Compounds (Pyrethroids/Pyrethrins) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Bifentrhin Cyfluthrin, Total Cypermethrin, Total Deltamethrin, Total Esfenvalerate/ Fenvalerate, Total Lambda-cyhalothrin, Total cis-Permethrin trans-Permethrin	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction .
Recommended Surrogates (% Recovery)					
Dibromooctafluorobiphenyl					

Table B-31 Sampling and Preservation – Synthetic Organic Compounds (Phenols) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Pentachloro-phenol	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to ≤6 °C in the dark; pH 5-9.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
2,3,5,6-Tetrachlorophenol	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
2,4,6-Trimethylphenol					

Table B-32 Sampling and Preservation – Synthetic Organic Compounds (Glyphosate) in Water

Analyte	Units	Recommended Container	Recommended Sample Volume	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
Glyphosate	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	6 months at -20 °C; Samples must be analyzed within 7 days of collection or thawing
AMPA	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	6 months at -20 °C; Samples must be analyzed within 7 days of collection or thawing

Table B-33 Sampling and Preservation – Synthetic Organic Compounds (Surfactants) in Water

Analyte	Units	Recommended Container	Recommended Sample Volume	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
Nonlyphenol Nonylphenol-ethoxylate	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
2,4,6-Trimethylphenol					

Table B-34 Sampling and Preservation – Synthetic Organic Compounds (Surfactants) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation***	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Nonylphenol Nonylphenol-ethoxylate	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
2,4,6-Trimethylphenol					

Table B-35 Sampling and Preservation – Synthetic Organic Compounds (Surfactants) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation***	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Nonylphenol Nonylphenol-ethoxylate	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
2,4,6-Trimethylphenol					

* Unless otherwise specified by method.

Table B-36 Sampling and Preservation – Synthetic Organic Compounds (Carbamate Pesticides) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Aldicarb **Captan** **Carbaryl** **Carbofuran** **Diuron** **Linuron** **Methiocarb** **Methomyl**	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to ≤6 °C in the dark; pH 5-9.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.

Table B-37 Sampling and Preservation – Synthetic Organic Compounds (Triazines) in Water					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Volume**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
Ametryn **Atraton** **Atrazine** **Prometon** **Prometryn** **Propazine** **Secbumeton** **Simazine** **Simetryn** **Terbuthylazine** **Terbutryn**	ug/L	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses (QC samples or other analytes require additional sample bottles)	Cool to 6 °C in the dark.	Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
Triphenyl phosphate					

Table B-38 Sampling and Preservation – Synthetic Organic Compounds (Organotins) in Sediment

Analyte	Units	Recommended Container	Recommended Sample Mass	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
Dibutyltin	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Tributlytin	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.

Table B-39 Sampling and Preservation – Synthetic Organic Compounds (Organotins) in Tissue

Analyte	Units	Recommended Container	Recommended Sample Mass	Recommended Preservation	Required Holding Time
		QAPP Element 11	QAPP Element 11	QAPP Element 12	QAPP Element 12
Dibutyltin	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Tributlytin	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.

Table B-40 Sampling and Preservation – Synthetic Organic Compounds (Polybrominated Diphenyl Ethers) in Sediment					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
PBDE 17 **PBDE 28** **PBDE 47** **PBDE 66** **PBDE 85** **PBDE 99** **PBDE 100** **PBDE 138** **PBDE 153** **PBDE 154** **PBDE 183** **PBDE 190**	ng/g	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to 6 °C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
DDD (p,p')					

Table B-41 Sampling and Preservation – Synthetic Organic Compounds (Polybrominated Diphenyl Ethers) in Tissue					
Analyte	**Units**	**Recommended Container**	**Recommended Sample Mass**	**Recommended Preservation**	**Required Holding Time**
		QAPP Element 11	**QAPP Element 11**	**QAPP Element 12**	**QAPP Element 12**
PBDE 17 **PBDE 28** **PBDE 47** **PBDE 66** **PBDE 100** **PBDE 99** **PBDE 85** **PBDE 154** **PBDE 153** **PBDE 138** **PBDE 183** **PBDE 190**	ng/g	Polyethylene bags (Teflon sheets in zip bags) or glass jars with Teflon lids	200 g	Cool to 6 °C	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Recommended Surrogates (% Recovery)					
DDD (p,p')					

Appendix C

SWAMP Requirements and Recommendations – Information for Completing Element 7 (Quality Objectives and Criteria) and Element 13 (Analytical Methods)

Table C-1 SWAMP Reporting Limits – Conventionals in Water	
Analyte	**Water (mg/L)***
Ammonia (as N)	0.1
Biochemical Oxygen Demand	2
Boron	0.010
Chloride	0.25
Chlorophyll a Pheophytin a	0.002
Chemical Oxygen Demand (titrametric)	5
Cyanide	not listed
Dissolved Phosphorus (as P)	not listed
Fluoride	0.123
Iron	0.02
Nitrate (as N)	0.01
Nitrate + Nitrite (as N)	0.1
Nitrite (as N)	0.01
Oil and Grease (HEM)	1.4
Organic Carbon (Dissolved)	0.6
Organic Carbon (Total)	0.6
Orthophosphate (as P)	0.01
Phenols	not listed
Silica	0.1
Sulfate	1.0
Specific Conductivity	2.5 µS/cm
Total Alkalinity (as $CaCO_3$)	1
Total Calcium	0.05
Total Hardness (as $CaCO_3$)	1
Total Kjeldahl Nitrogen	0.5
Total Magnesium	0.02
Total Phosphorus (as P)	not listed
Total Potassium	0.1
Total Sodium	0.1
Turbidity	0.5 NTU

Table C-2 SWAMP Reporting Limits – Conventionals – Aqueous Solids	
Analyte	**Solids (mg/L)**
Fixed & Volatile Dissolved Solids (500 C) 550 C	5.0
Suspended Sediment Concentration	0.5
Total Dissolved Solids	10
Total Suspended Solids (103-105 °C)	0.5
Volatile Suspended Solids	1.0

Table C-3 SWAMP Reporting Limits – Conventionals - Pathogens	
Analyte	**MPN/100 mL***
Pathogens – E. Coli	2
Pathogens – Enterococcus	1 colonies/100 mL
Pathogens –Fecal Coliform	2
Pathogens – Total Coliform	2
Pathogens – Streptococcus	not listed

Table C-4 SWAMP Reporting Limits – Conventionals - Solids	
Analyte	**Solids**
Sediment Grain Size Analysis	1%
Sediment Total Organic Carbon	0.01% OC
%Moisture	n/a
%Lipids	n/a

Table C-5 SWAMP Reporting Limits – Inorganic Analytes			
Analyte	**Water (µg/L)**	**Sediment (mg/kg)**	**Tissue (mg/kg)**
Aluminum	0.3	0.3	0.3
Arsenic	0.3	0.3	0.3
Cadmium	0.01	0.01	0.01
Chromium	0.1	0.1	0.1
Copper	0.01	0.01	0.01
Lead	0.01	0.01	0.01
Manganese	0.01	0.01	0.01
Mercury	0.0002	0.03	0.03
Methylmercury	0.00005	0.00002	0.0100
Nickel	0.02	0.02	0.02
Selenium	0.30	0.10	0.30
Silver	0.02	0.02	0.02
Zinc	0.10	0.10	0.10

Table C-6 SWAMP Reporting Limits – Volatile Organics		
Analyte	**Water (µg/L)**	**Sediment (mg/kg)**
1,1-Dichloroethane		
1,1-Dichloroethylene		
1,1-Dichloropropene		
1,1,1-Trichloroethane		
1,1,2-Trichloroethane		
1,1,1,2-Tetrachloroethane		
1,1,2,2-Tetrachloroethane		
1,2 -Dibromoethane		
1,2-Dichlorobenzene		
1,2-Dichloroethane		
1,2-Dichloropropane		
1,2-cis-Dichloroethylene		
1,2-trans-Dichloroethylene		
1,2,3-Trichlorobenzene,		
1,2-Dibromo-3-chloropropane		
1,2,3-Trichloropropane		
1,2,4-Trichlorobenzene		
1,2,4-Trimethylbenzene		
1,3-Dichlorobenzene		
1,3-Dichloropropane		
1,3,5-Trimethylbenzene		
1,4-Dichlorobenzene		
2-Chlorotoluene		
2,2-Dichloropropane		
4-Chlorotoluene		
Benzene	0.08	20
Bromobenzene		
Bromochloromethane		
Bromodichloromethane		
Bromoform		
Carbon tetrachloride		
Chlorobenzene		
Chloroform		
Dibromochloromethane		
Dibromomethane		
Ethylbenzene		
Fluorobenzene		
Hexachlorobutadiene		
Isopropylbenzene		
Methyl tert-butyl ether(MTBE)		
m/p-Xylene		
Naphthalene		
n-Butylbenzene		
n-Propylbenzene		
o-Xylene		
p-Isopropyltoluene		
sec-Butylbenzene		
tert-Butylbenzene		
Tetrachloroethylene		
Toluene		
Trichloroethylene		
Total Xylene		

Table C-7 SWAMP Reporting Limits – Semi-Volatile Organics		
Analyte	**Water (µg/L)**	**Sediment (mg/kg)**
1,2-Dichlorobenzene		
1,2,4-Trichlorobenzene		
1,4-Dichlorobenzene		
2-Chloronaphthalene		
2-Chlorophenol		
2-Methylnaphthalene		
1,2,4-Trichlorobenzene		
2-Methylphenol		
2-Nitroaniline		
2-Nitrophenol		
2,4-Dichlorophenol		
2,4-Dimethylphenol		
2,4-Dinitrophenol		
2,4-Dinitrotoluene		
2,4,5-Trichlorophenol		
2,4,6-Trichlorophenol		
2,6-Dinitrotoluene		
3-Nitroaniline		
3,4-Methylphenol		
4-Bromophenyl phenyl ether		
4-Chloro-3-methylphenol		
4-Chloroaniline		
4-Chlorophenyl phenyl ether		
4-Nitroaniline		
4-Nitrophenol		
4,6-Dinitro-2-methylphenol		
Acenaphthene		
Acenaphthylene		
Anthracene		
Benz[a]anthracene	10	0.3
Benzo[a]pyrene		
Benzo[b]fluoranthene		
Benzo[g,h,i]perylene		
Benzo[k]fluoranthene		
Bis(2-chloroethoxy)methane		
Bis(2-chloroethyl) ether		
Bis(2-ethylhexyl) phthalate		
Butyl benzyl phthalate		
Carbazole		
Chrysene		
Dibenzofuran		
Diethyl phthalate		
Dimethyl phthalate		
Di-n-butyl phthalate		
Di-n-octyl phthalate		
Hexachlorobenzene		
Hexachlorobutadiene		
Hexachlorocyclopentadiene		
Hexachloroethane		
Indeno[1,2,3-cd]pyrene		
Isophorone		
Naphthalene		
Nitrobenzene		
n-Nitrosodi-n-propylamine		
Pentachlorophenol		
Phenanthrene		
Phenol		
Pyrene		
Total Xylenes		

Table C-8 SWAMP Reporting Limits – Synthetic Organic Compounds Polychlorinated Biphenyls as Congeners/Aroclor Compounds			
Analyte	**Water (µg/L)**	**Sediment (ng/g)**	**Tissue (ng/g)**
PCB 5 PCB 8 PCB 15 PCB 18 PCB 27 PCB 28 PCB 29 PCB 31 PCB 33 PCB 44 PCB 49 PCB 52 PCB 56 PCB 60 PCB 66 PCB 70 PCB 74 PCB 87 PCB 95 PCB 97 PCB 99 PCB 101 PCB 105 PCB 110 PCB 114 PCB 118 PCB 128 PCB 137 PCB 138 PCB 141 PCB 149 PCB 151 PCB 153 PCB 156 PCB 157 PCB 158 PCB 170 PCB 174 PCB 177 PCB 180 PCB 183	0.002	0.2	0.4
PCB 187	0.002	0.2	0.4
PCB 189	1.0	10	20
PCB 194	0.002	0.2	0.4
PCB 195	0.002	0.2	0.4
PCB 200	0.002	0.2	0.4
PCB 201	0.002	0.2	0.4

Table C-8 SWAMP Reporting Limits – Synthetic Organic Compounds Polychlorinated Biphenyls as Congeners/Aroclor Compounds			
Analyte	**Water (µg/L)**	**Sediment (ng/g)**	**Tissue (ng/g)**
PCB 203	0.002	0.2	0.4
PCB 206	0.002	0.2	0.4
PCB 209	0.002	0.2	0.4
Aroclor 1248	2.5	25	50
Aroclor 1254	1.0	10	20
Aroclor 1260	1.0	10	20

Table C-9 SWAMP Reporting Limits – Synthetic Organic Compounds Polynuclear Aromatic Hydrocarbons			
Analyte	**Water (µg/L)**	**Sediment (ng/g)**	**Tissue (ng/g)**
1-Methylfluorene 1-Methyl-naphthalene 1-Methyl-phenanthrene 2-Methylfluoranthene 2-Methyl-naphthalene 2,3,5-Trimethyl-naphthalene 2,6-Dimethyl-naphthalene 3,6-Dimethyl-phenanthrene 4-Methyl-dibenzothiophene Acenaphthene Acenaphthylene Anthracene Benz(a) anthracene Benzo(a) pyrene Benzo(b) fluoranthene Benzo(e) pyrene Benzo(g,h,i) perylene Benzo(k) fluoranthene Biphenyl C1-Chrysenes C1-Dibenzo-thiophenes C1-Fluorenes C1-Fluoranthene/ Pyrenes C1-Naphthalenes C1-Phenanthrene/ Anthracene C2-Chrysenes C2-Dibenzo-thiophenes C2-Fluorenes C2-Naphthalenes C2-Phenanthrene/ Anthracene C3-Chrysenes C3-Dibenzo-thiophenes C3-Fluorenes C3-Naphthalenes C3-Phenanthrene/ Anthracene C4-Naphthalenes C4-Phenanthrene/ Anthracene Chrysenes Dibenz(a,h) anthracene Dibenzo-thiophene Fluoranthene Fluorene Indeno(1,2,3-c,d) pyrene Naphthalene Perylene Phenanthrene Pyrene	10	20	100

Table C-10 SWAMP Reporting Limits – Synthetic Organic Compounds -Organochlorine Pesticides			
Analyte	**Water (μg/L)**	**Sediment (ng/g)**	**Tissue (ng/g)**
Aldrin	0.002	1	2
alpha-HCH	0.002	1	2
cis-Chlordane	0.002	2	4
beta-HCH	0.002	2	4
trans-Chlordane	0.002	2	4
Dacthal	0.002	2	4
DDD (o,p')	0.002	2	4
DDD (p,p')	0.002	2	4
DDE (o,p')	0.002	2	4
DDE (p,p')	0.002	2	4
DDMU (p,p')	0.002	3	6
DDT (o,p')	0.002	3	6
DDT (p,p')	0.005	5	10
delta-HCH	0.002	2	4
Dieldrin	0.002	2	4
Endosulfan I	0.002	2	4
Endosulfan II	0.002	10	20
Endosulfan sulfate	0.002	10	20
Endrin	0.002	2	4
Endrin Aldehyde	0.005	n/a	n/a
Endrin Ketone	0.005	n/a	n/a
gamma-HCH	0.002	1	2
Heptachlor	0.002	2	4
Heptachlorepoxide	0.002	1	2
Hexachlorobenzene	0.001	0.3	0.6
Methoxychlor	0.002	5	10
Mirex	0.002	3	6
cis-Nonachlor	0.002	2	4
trans-Nonachlor	0.002	1	2
Oxadiazon	0.002	3	6
Oxychlordane	0.002	1	2
Tedion	0.002	2	4
Toxaphene	n/a	20	40

Table C-11 SWAMP Reporting Limits – Synthetic Organic Compounds – Organophosphate Pesticides			
Analyte	**Water (µg/L)**	**Sediment (ng/g)**	**Tissue (ng/g)**
Aspon	0.050	n/a	n/a
Azinphos ethyl	0.050	n/a	n/a
Carbophenothion	0.050	n/a	n/a
Chlorfenvinphos	0.050	n/a	n/a
Chlorpyrifos	0.050	2	4
Chlorpyrifos methyl	0.050	n/a	n/a
Ciodrin	0.050	n/a	n/a
Coumaphos	0.050	n/a	n/a
Demeton-s	0.050	n/a	n/a
Diazinon	0.050	20	40
Naled	0.050	n/a	n/a
Dichlofenthion	0.050	n/a	n/a
Dichlorvos	0.050	n/a	n/a
Dicrotophos	0.050	n/a	n/a
Dimethoate	0.050	n/a	n/a
Dioxathion	0.050	n/a	n/a
Disulfoton	0.050	n/a	n/a
Ethion	0.050	6	12
Famphur	0.050	n/a	n/a
Fenchlorophos	0.050	n/a	n/a
Fenitrothion	0.050	n/a	n/a
Fensulfothion	0.050	n/a	n/a
Fenthion	0.050	n/a	n/a
Fonofos	0.050	n/a	n/a
Azinphos methyl	0.050	n/a	n/a
Leptophos	0.050	n/a	n/a
Malathion	0.050	n/a	n/a
Methidathion	0.050	n/a	n/a
Parathion, ethyl	0.050	2	4
Parathion, methyl	0.050	4	8
Molinate	0.050	n/a	n/a
Phorate	0.050	n/a	n/a
Mevinphos	0.050	n/a	n/a
Phosmet	0.050	n/a	n/a
Phosphamidon	0.050	n/a	n/a
Ethoprop	0.050	n/a	n/a
Sulfotep	0.050	n/a	n/a
Bolstar	0.050	n/a	n/a
Terbufos	0.050	n/a	n/a
Tetrachlorvinphos	0.050	n/a	n/a
Thiobencarb	0.050	n/a	n/a
Thionazin	0.050	n/a	n/a
Tokuthion	0.050	n/a	n/a
Merphos	0.050	n/a	n/a
Trichlorfon	0.050	n/a	n/a
Trichloronate	0.050	n/a	n/a

Table C-12 Reporting Limits – Field Measurements**			
Water Quality Parameter	**Recommended Device**	**Units**	**Reporting Limit**
Depth	Stadia Rod/Staff Gauge	m	0.02
Dissolved Oxygen	Polarographic or Luminescence Quenching	mg/L	0.2
pH	Electrode	None	n/a
Salinity	Refractometer or Conductivity Cell	‰	2
Specific Conductivity	Conductivity Cell	µS/cm	2
Temperature	Thermistor or Bulb	°C	n/a
Total Chlorophyll	Optical Fluorescence Chlorophyll Probe	µg/L	n/a
Turbidity	Portable Turbidimeter or Optical Probe	NTU	5
Velocity	Flow Meter	ft/s	0.1

** This table may not include all field analyses. Please refer to method or manufacturer instructions for guidance.

Appendix D

SWAMP Requirements and Recommendations – Information for Completing Element 14 (Quality Control) and Element 16 (Instrument Calibration and Frequency)

Table D-1 Measurement Quality Objectives – Conventional Analytes in Water			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte	Element 14
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery	Element 16
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery	Element 14
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent (chlorophyll: n/a)	80-120% recovery RPD<25% for duplicates	Element 14
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent (chlorophyll: per method)	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Internal Standard	Accompanying every analytical run as method appropriate	Per method	Element 16
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analyte	Element 14

Table D-2 Measurement Quality Objectives – Conventional Analytes in Water – Solids			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte	Element 14
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Field Blank, Equipment Blank	Per method	<RL for target analyte	Element 14

Table D-3 Measurement Quality Objectives – Conventional Analytes in Water – Pathogens			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration	Check temperatures in incubators twice daily with a minimum of 4 hours between each reading	Per analytical method or manufacturer's specifications	Element 16
Filter Sterility Check	Perform one filter sterility check each day samples are analyzed	No growth on filter	Element 14
Laboratory Blank	Per batch of bottles or reagents	No growth on filter	Element 14
Filtration Blank	Per 20 samples or per analytical batch, whichever is more frequent	No growth on filter	Element 14
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery	Element 16
Positive Control	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery	Element 14
Negative Control	Per 20 samples or per analytical batch, whichever is more frequent	No growth on filter	Element 14
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Field Duplicate	5% of total project sample count (coliforms: one per 25 tube dilution tests)	RPD<25% (n/a if native concentration of either sample<RL; coliforms: within 95% confidence interval as defined by IDEXX Laboratories)	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	Blanks<RL for target analyte	Element 14

Table D-4 Measurement Quality Objectives – Conventional Analytes in Sediments			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 10 analytical runs (as applicable)	80-120% recovery	Element 16
Laboratory Blank	TOC only: one per analytical batch (n/a for others)	<RL or <30% of lowest sample	Element 14
Reference Material	TOC only: one per 20 samples or per analytical batch, whichever is more frequent (n/a for others)	80-120% recovery	Element 14
Matrix Spike	n/a	n/a	n/a
Matrix Spike Duplicate	n/a	n/a	n/a
Laboratory Duplicate	One per analytical batch	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Surrogate or Internal Standard	n/a	n/a	n/a
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	<RL or <30% of lowest sample	Element 14

Table D-5 Measurement Quality Objectives – Inorganic Analytes in Water, Sediment, and Tissue			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte	Element 14
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)	Element 14
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)	Element 14
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg); RPD<25%	Element 14
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)	Element 14
Internal Standard	Accompanying every analytical run when method appropriate	60-125% recovery	Element 16
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL), unless otherwise specified by method	Element 14
Field Blank, Equipment Blank	Per method	Blanks<RL for target analyte	Element 14

Table D-6 Measurement Quality Objectives – Volatile Organic Compounds in Water and Sediment			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Template**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 12 hours	RF for SPCCs same as initial calibration; RF of CCVs must be within 20% of initial calibration	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte	Element 14
Reference Material	Method Validation: as many as required to assess accuracy and precision of method before routine analysis of samples; Routine Accuracy Assessment: per 20 samples or per analytical batch (preferably blind)	70-130% recovery if certified; otherwise 50-150% recovery	Element 16
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries	Element 14
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25%	Element 14
Laboratory Duplicate	Per method	Per method	Element 14
Surrogate or Internal Standard	Per method	Per method	Element 16
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Field Duplicate	5% of total project sample count	Per method	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analyte	Element 14

Table D-7 Measurement Quality Objectives – Semi-Volatile Organic Compounds in Water and Sediment			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 12 h	RF for SPCCs same as initial calibration; RF of CCVs must be within 20% of initial calibration	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte	Element 14
Reference Material	Method Validation: as many as required to assess accuracy and precision of method before routine analysis of samples; Routine Accuracy Assessment: per 20 samples or per analytical batch (preferably blind)	70-130% recovery if certified; otherwise, 50-150% recovery	Element 16
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries	Element 14
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25%	Element 14
Laboratory Duplicate	Per method	Per method	Element 14
Surrogate or Internal Standard	Per method	Per method	Element 16
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	
Field Duplicate	5% of total project sample count	Per method	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analyte	Element 14

Table D-8 Measurement Quality Objectives – Synthetic Organic Compounds in Water, Sediment and Tissue			
Laboratory Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications	Element 16
Continuing Calibration Verification	Per 10 analytical runs	Water: 85-115% recovery Sediment: 85-115% recovery Tissue: 75-125%	Element 16
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analytes	Element 14
Reference Material	Method Validation: as many as required to assess accuracy and precision of method before routine analysis of samples; Routine Accuracy Assessment: per 20 samples or per analytical batch (preferably blind)	70-130% recovery if certified; otherwise, 50-150% recovery	Element 16
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries	Element 14
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25%	Element 14
Laboratory Duplicate	Per method	Water: RPD<25% (n/a if native concentration of either sample<RL) Sediment: Per method Tissue: Per method	Element 14
Surrogate or Internal Standard	Per method	Per method	Element 16
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**	**QAPP Element**
Field Duplicate	5% of total project sample count	Per method	Element 14
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analytes	Element 14

ELISA results must be assessed against kit requirements.

Table D-9 Measurement Quality Objectives – Toxicity Testing (General)			
Negative Controls	**Frequency of Analysis**	**Control Limits**	**QAPP Element**
Laboratory Control Water	Laboratory Control Water consistent with Section 7 of the appropriate EPA method must be tested with each analytical batch.	Laboratory Control Water must meet all test acceptability criteria (Please refer to Section 7 of the EPA manuals) for the species of interest.	Element 14
Conductivity Control Water	A conductivity control must be tested with each analytical baych when the conductivity of any freshwater ambient sample approaches the species' tolerance for conductivity per method.	Follow EPA guidance on interpreting data.	Element 14
Additional Control Water	Additional method blanks are required whenever manipulations are performed on one or more of the ambient samples within each analytical batch (e.g. pH adjustments, continuous aeration, etc.).	No statistical difference between the laboratory control water and each additional control water within an analytical batch.	Element 14
Sediment Control	Sediment Control consistent with those described in Section 7 of the EPA manual must be tested with each analytical batch of sediment toxicity tests.	Sediment Control must meet all data acceptability criteria (Please refer to Section 7 of the EPA manuals) for the species of interest.	Element 14
Positive Controls	**Frequency of Analysis**	**Control Limits**	**QAPP Element**
Reference Toxicant Tests	Reference Toxicant Tests must be conducted monthly for species that are raised within a laboratory. Reference Toxicant Test must be conducted per analytical batch for species from commercial supplier settings. Reference Toxicant Tests must be conducted concurrently for test species or broodstocks that are field collected.	Last plotted data point must be within 2 SD of the cumulative mean (n=20). (Reference toxicant tests that fall outside of recommended control chart limits are evaluated to determine the validity of associated effluent and receiving water tests. An out of control reference toxicant test result does not necessarily invalidate associated test results. More frequent and/or concurrent reference toxicant testing may be advantageous if recent problems have been identified in testing.)	Element 14
Field Quality Control	**Frequency of Analysis**	**Control Limits**	**QAPP Element**
Field Duplicate	5% of total project sample count	According to method	Element 14

Table D-9 Measurement Quality Objectives – Toxicity Testing (General)			
Field Blanks	Per method or project requirements	No statistical difference between the laboratory control water (or sediment control) and the field blank within an analytical batch	Element 14
Equipment Blanks	Per method or project requirements	No statistical difference between the Laboratory Control Water and the Equipment Blank within an analytical batch	Element 14

In special cases where the criteria listed in the following tables cannot be met, EPA minimum criteria may be followed. The affected data should be qualified accordingly.

Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

Deviations from the summary of recommended test conditions must be evaluated on a project specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result depending on the degree of the departure and the objective of the test. The reviewer should consider the degree of the deviation and the potential or observed impact of the deviation on the test result before rejecting or accepting a test result is valid. For example, if dissolved oxygen is measured below 4.0 mg/L in one test chamber, the reviewer should consider whether any observed mortality in that test chamber corresponded with the drop in dissolved oxygen.

Table D-10 Measurement Quality Objectives - Field Measurementsa - QAPP Element 16

Water Quality Parameter	Points Per Calibration[b]	Pre-Measurement Calibration Adjustment Frequency[e]	Accuracy Check (Post-Calibration Check) Frequency	Allowable Drift (Measurement Accuracy)[c, d, e]
Depth	2	n/a	Quarterly	± 0.02 or 2%
Dissolved Oxygen	1	Before every monitoring day (and more often when changing elevation)	After every monitoring day or next morning	± 0.5 or 10%
pH	2	Before every monitoring day	Every evening or next morning	± 0.2
Salinity	2	Per drift rate (instrument-specific)	Per drift rate (instrument-specific	± 4 or 10%
Specific Conductivity	2	Per manufacturer's instructions	Per manufacturer's instructions	± 4 or 10%
Temperature	2	n/a	Once annually	± 0.5 or 10%
Total Chlorophyll	Follow manufacturer's instructions	Per manufacturer's instructions	Per manufacturer's instructions	Follow manufacturer's instructions
Turbidity	2	Per manufacturer's instructions	Per manufacturer's instructions	± 2 or 10%
Velocity	Follow manufacturer's instructions	Per manufacturer's instructions	Per manufacturer's instructions	Follow manufacturer's instructions

[a] This table may not include all field analyses. Please refer to method or manufacturer instructions for guidance.
[b] Unless otherwise specified by method or manufacturer instructions.
[c] Manufacturers often provide accuracy specifications that relate to the intrinsic capabilities of the instrument. These must not be confused with measurement output or drift between two consecutive calibration adjustments.
[d] Unit or percentage, whichever is greater.
[e] Recalibration is recommended if an elevation change of 500 feet occurs (especially for Dissolved Oxygen).

Table D-11 Recommendations for Field Measurements for Element 14

Group	Parameter	Element 14 Quality Control
Field testing	Dissolved Oxygen	No SWAMP requirement – suggest replicate (3) measurements plus maintenance practices.
	Temperature	No SWAMP requirement – suggest replicate (3) measurements plus maintenance and calibration practices.
	Conductivity	No SWAMP requirement – suggest replicate (3) measurements plus maintenance and calibration practices
	pH by meter	No SWAMP requirement – suggest replicate (3) measurements, check against second pH buffer, plus maintenance and calibration practices
	Depth	No SWAMP requirement – suggest rely on maintenance and calibration practices
	Turbidity	No SWAMP requirement – suggest replicate (3) measurements plus maintenance and calibration practices
Field Test Kit	All inorganic chemical tests	No SWAMP requirement – suggest replicate (3) measurements, comparison against a known standard, and 10% check against laboratory measurement each sample run.
	ELISA	Positive and negative (interference) checks, and 5% checks against laboratory measurement. RPD for Chlorpyrifos and diazinon within 50%
Mobile Laboratory	ALL	Same as stationary laboratory

Table D-12 Corrective Action – Conventional Analytes (Water)		
Laboratory Quality Control	**Corrective Action**	**QAPP Element**
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.	QAPP Element 14
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last calibration verification must be reanalyzed.	QAPP Element 16
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.	QAPP Element 14
Reference Material	Affected samples and associated quality control must be reanalyzed following instrument recalibration.	QAPP Element 16
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.	QAPP Element 14
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.	QAPP Element 14
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.	QAPP Element 14
Internal Standard	As method requires. The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.	QAPP Element 16
Field Quality Control	**Corrective Action**	**QAPP Element**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14

Table D-13 Corrective Action – Conventional Analytes (Total Solids, Suspended Sediment Concentration, and Percent Lipids)		
Laboratory Quality Control	**Corrective Action**	**QAPP Element**
Calibration Standard	n/a	QAPP Element 16
Initial/Continuing Calibration Verification	n/a	QAPP Element 16
Laboratory Blank	Please refer to method requirements.	QAPP Element 14
Reference Material	Please refer to method requirements.	QAPP Element 16
Matrix Spike	n/a	QAPP Element 14
Matrix Spike Duplicate	n/a	QAPP Element 14
Laboratory Duplicate*	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows. A matrix spike duplicate may not be analyzed in place of a laboratory duplicate.	QAPP Element 14
Internal Standard	n/a	QAPP Element 16
Field Quality Control	**Corrective Action**	**QAPP Element**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14

* Not applicable to suspended sediment concentration analyses.

Table D-14 Corrective Action – Inorganic Chemistry		
Laboratory Quality Control	**Corrective Action**	**QAPP Element**
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration	QAPP Element 16
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated if necessary. If deemed appropriate, all samples after the last acceptable continuing calibration verification may be reanalyzed.	QAPP Element 16
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.	QAPP Element 14
Reference Material	If deemed appropriate, affected samples and associated quality control may be reanalyzed following instrument recalibration.	QAPP Element 16
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.	QAPP Element 14
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.	QAPP Element 14
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.	QAPP Element 14
Internal Standard	As method requires. The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.	QAPP Element 16
Field Quality Control	**Corrective Action**	**QAPP Element**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14
Field Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14

Table D-15 Corrective Action – Organic Chemistry		
Laboratory Quality Control	**Corrective Action**	**QAPP Element**
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.	QAPP Element 16
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last acceptable continuing calibration verification must be reanalyzed.	QAPP Element 16
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.	QAPP Element 14
Reference Material	Affected samples and associated quality control must be reanalyzed following instrument recalibration.	QAPP Element 16
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.	QAPP Element 14
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.	QAPP Element 14
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.	QAPP Element 14
Internal Standard	Analyze as appropriate per method. Troubleshoot as appropriate. If, after trouble-shooting, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.	QAPP Element 16
Surrogate	Analyze as appropriate per method. All affected results should be qualified. The analytical method or quality assurance project plan must detail procedures for updating surrogate measurement quality objectives.	QAPP Element 16
Field Quality Control	**Corrective Action**	**QAPP Element**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the project coordinator, who in turn will follow the process detailed in the method.	QAPP Element 14

Table D-16 Corrective Action – Toxicity Testing		
Negative Controls	**Corrective Action**	**QAPP Element**
Laboratory Control Water	If tested with in-house cultures, affected samples and associated quality control must be retested within 24 hours of test failure. If commercial cultures are used, they must be ordered within 16 hours of test failure for earliest possible receipt, and retests must be initiated within 8 hours of receipt. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.	QAPP Element 14
Conductivity Control Water	Affected samples and associated quality control must be qualified.	QAPP Element 14
Additional Control Water	A water sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence. This is not applicable for TIE method blanks.	QAPP Element 14
Laboratory Control Sediment	Affected samples and associated quality control must be re-tested within 24 hours of test failure if tested with in-house cultures. If commercial cultures are used, they must be ordered within 16 hours of test failure for earliest possible receipt, and re-tests must be initiated within 8 hours of receipt. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.	QAPP Element 14
Additional Control Sediment	A sediment sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.	QAPP Element 14
Positive Controls	**Corrective Action**	**QAPP Element**
Reference Toxicant Tests	If LC50 exceeds +/- two standard deviations of the running mean of the last 20 reference toxicant tests, the test should be qualified or repeated.	QAPP Element 14
Field Quality Control	**Corrective Action**	**QAPP Element**
Field Duplicate	For duplicates with a heterogeneous matrix, results that do not meet SWAMP criteria should be qualified. All field duplicate results that do not meet SWAMP criteria should be communicated to the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.	QAPP Element 14
Field Blanks	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data and notify the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.	QAPP Element 14
Equipment Blanks	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data and notify the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.	QAPP Element 14

Table D-17 Corrective Action – Field Measurements		
Field Quality Control	**Corrective Action**	**QAPP Element**
Depth, Dissolved Oxygen, pH, Salinity, Specific Conductance, Temperature, Turbidity, Velocity	The instrument should be recalibrated following its manufacturer's cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded in the calibration and field data logbooks.	QAPP Element 16

Appendix E

SWAMP Requirements and Recommendations – Information for Completing Element 7 (Quality Objectives and Criteria), Element 11 (Sampling Methods), Element 12 (Sample Handling and Custody), Element 13 (Analytical Methods and Field Measurements), Element 14 (Quality Control), and Element 16 (Instrument Calibration and Frequency) for Specific Toxicity Tests

Table E-1 Measurement Quality Objectives - 7-Day Pimephales promelas Survival and Growth Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/821/R-02/013 (Test Method 1000.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	80% or greater survival in controls and an average dry weight per surviving organism in control chambers equals or exceeds 0.25 mg
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static renewal (required)
Age at Test Initiation	Newly-hatched larvae <24hours old. If shipped, <48 hours old with a 24-hour age range
Replication at Test Initiation	4 (minimum) **(QAPP Element 14)**
Organisms/Replicate	10 (minimum) **(QAPP Element 14)**
Food Source	Newly-hatched *Artemia* nauplii (<24hoursold)
Renewal Frequency	Daily
Test Duration	7 days
Endpoints	Survival and biomass
Test Conditions	*Recommended***
Temperature Range	25 ± 1.0 °C (+/- 3 °C required)
Light Intensity	10 – 20 µE/m^2/s or 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	>500 mL or per method specific requirements
Replicate Volume	>250 mL or per method specific requirements **(QAPP Element 14)**
Feeding Regime	< 2 times per day
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Minimum Sample Volume	7 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<30% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample (recommended)
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One DO and one pH measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement and per sample and per dilution (one DO per renewal)

Table E-1 Measurement Quality Objectives - 7-Day Pimephales promelas Survival and Growth Toxicity Tests	
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 – 8.6 mg/L
Initial pH Range	6.0 – 9.0
Conductivity Controls	Per method - recommend including appropriate controls when sample conductivities are below 100 or above 2500 µS/cm
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<3000 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass or plastic (per method)
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-2 Measurement Quality Objectives – Chronic Ceriodaphnia dubia Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/821/R-02/013 (Test Method 1002.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	80% or greater survival of al control organisms and an average of 15 or more young per surviving female. 60% of the surviving control females must produce three broods.
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static renewal (required)
Age at Test Initiation	<24 hours old and all released within an 8-hour period
Replication at Test Initiation	>10 **(QAPP Element 14)**
Organisms/Replicate	One (assigned using blocking by known parentage) **(QAPP Element 14)**
Food Source	YCT and *Selenastrum* or comparable food
Renewal Frequency	Daily
Test Duration	<8 days
Endpoints	Survival and reproduction
Test Conditions	*Recommended***
Temperature Range	25 ± 1.5 °C (+/- 3 °C required)
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16hoursof ambient laboratory light, 8hoursdark
Test Chamber Size	20 - 40 mL
Replicate Volume	>15 mL **(QAPP Element 14)**
Feeding Regime	Daily
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Minimum Sample Volume	2 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<47% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	Two DO , one pH and one temperature per 24-h period in one sample per concentration and in the control

Table E-2 Measurement Quality Objectives – Chronic Ceriodaphnia dubia Toxicity Tests	
Final Water Chemistry	One DO, pH, and temperature measurement per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are <100 or >2000 µS/cm
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	2500 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-3 Measurement Quality Objectives – 96-Hour (48- and 24-Hour) Ceriodaphnia dubia Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/821/R-02/012 (Test Method 2002.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	>90% survival in controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal or static renewal
Age at Test Initiation	<24 hours
Replication at Test Initiation	>4 **(QAPP Element 14)**
Organisms/Replicate	>5 **(QAPP Element 14)**
Food Source	YCT and *Selenastrum* or comparable food
Renewal Frequency	Daily (unless otherwise specified by method)
Test Duration	96 hours(48 hours or 24 hours optional)
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	25 ± 1 °C (+/- 3 °C required)
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	20 - 40 mL
Replicate Volume	>15 mL **(QAPP Element 14)**
Feeding Regime	Feed while holding prior to test and 2 hours prior to test solution renewal
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Minimum Sample Volume	1 L **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	No MSD available
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One DO and one temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are <100 or >2500 µS/cm
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<2500 µS/cm
Relevant Media	Water column

Table E-3 Measurement Quality Objectives – 96-Hour (48- and 24-Hour) Ceriodaphnia dubia Toxicity Tests	
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-4 Measurement Quality Objectives – 10-Day *Hyalella azteca* Water Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/821/R-02/013 (Test Method 1002.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	90% or greater survival in controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static renewal
Age at Test Initiation	7 – 14 days old
Replication at Test Initiation	5 **(QAPP Element 14)**
Organisms/Replicate	10 **(QAPP Element 14)**
Food Source	YCT
Renewal Frequency	80% renewal on Day 5
Test Duration	10 days
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	23 ± 1.0 °C
Light Intensity	500 - 1000 lux
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	300 mL
Replicate Volume	100 mL water **(QAPP Element 14)**
Feeding Regime	1.5 mL YCT every other day
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Minimum Sample Volume	1L **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	No MSD available
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	Temperature
Final Water Chemistry	One DO, EC, pH, and temperature measurement and per sample and per dilution (DO, EC, pH per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.7 - 8.92 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are below or above levels in method
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<15 ppt
Relevant Media	Water
Sample Container Type	Amber glass

Table E-4 Measurement Quality Objectives – 10-Day Hyalella azteca Water Toxicity Tests	
Sample Preservation	Wet or blue ice in field; 0 - 6 °C refrigeration in laboratory; dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-5 Measurement Quality Objectives – 10-Day *Hyalella azteca* Sediment Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-99/064 (Test Method 100.1) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	Mean control survival of >80% and measurable growth in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Whole sediment toxicity test with renewal of overlying water
Age at Test Initiation	7 – 14 days old
Replication at Test Initiation	8 **(QAPP Element 14)**
Organisms/Replicate	10 **(QAPP Element 14)**
Food Source	YCT
Renewal Frequency	Twice daily
Test Duration	10 days
Endpoints	Survival and growth
Test Conditions	*Recommended***
Temperature Range	23 ± 1.0 °C
Light Intensity	500 - 1000 lux
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	300 mL
Replicate Volume	Sediment volume 100 mL; Overlying water volume 175 mL **(QAPP Element 14)**
Feeding Regime	Daily
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Sediment Control	Control sediment as listed in method (Control sediment should follow EPA requirements for formulated sediments) **(QAPP Element 14)**
Minimum Sample Volume	6 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	No MSD available
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One DO and one temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.7 - 8.92 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are below or above levels listed in method
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<15 ppt
Relevant Media	Sediment

Table E-5 Measurement Quality Objectives – 10-Day Hyalella azteca Sediment Toxicity Tests	
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 14 days (recommended) or <8 weeks (required) @ 0 - 6 °C; dark; Do not freeze

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-6 Measurement Quality Objectives – 96-Hour Selenastrum capricornutum Growth Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/821/R-02/013 (Test Method 1003.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	Mean cell density of at least 1 X 10^6 cells/mL in the controls and variability (CV%) among control replicates less than or equal to 20% (non-EDTA: Mean cell density of at least 1 X 106 cells/mL in the controls; and variability (CV%) among control replicates less than or equal to 20% (required)
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	4 - 7 days
Replication at Test Initiation	10,000 cells/mL (recommended) **(QAPP Element 14)**
Organisms/Replicate	>4 **(QAPP Element 14)**
Food Source	n/a
Renewal Frequency	None
Test Duration	96 h
Endpoints	Growth
Test Conditions	*Recommended***
Temperature Range	25 ± 1 °C (+/- 3 °C required)
Light Intensity	86 ± 8.6 µE/m^2/s OR 400 ± 40 ft-c
Photoperiod	Continuous Illumination ("cool white" fluorescent lighting)
Test Chamber Size	125 mL or 250 mL
Replicate Volume	50 mL or 100 mL **(QAPP Element 14)**
Feeding Regime	None
Nutrient Media	Media prepared in accordance with EPA protocols
EDTA Addition	EDTA required per method
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols **(QAPP Element 14)**
Minimum Sample Volume	1 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<29% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and	One measurement per sample

Table E-6 Measurement Quality Objectives – 96-Hour Selenastrum capricornutum Growth Toxicity Tests	
Alkalinity	
Daily Water Chemistry	One pH and one temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement and per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are <100 or >2000 µS/cm
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<3000 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-7 Measurement Quality Objectives – 7-Day Atherinops affinis Larval Survival and Growth Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 (Test Method 1006.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥80% survival in controls, 0.85 mg average weight of control larvae (9 days old)
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static renewal
Age at Test Initiation	9 – 15 days post-hatch
Replication at Test Initiation	5 **(QAPP Element 14)**
Organisms/Replicate	5 **(QAPP Element 14)**
Food Source	Newly-hatched *Artemia* nauplii
Renewal Frequency	Daily
Test Duration	7 days
Endpoints	Survival and biomass
Test Conditions	*Recommended*
Temperature Range	20 ± 1.0 °C
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	600 mL
Replicate Volume	200 mL **(QAPP Element 14)**
Feeding Regime	Twice daily
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural sweater plus reagent water **(QAPP Element 14)**
Minimum Sample Volume	8 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<25% MSD for survival and <50% MSD for growth
Reference Toxicant Results	LC_{50} with copper must be ≤205 µg/L
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Salinity	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement and per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 9.0 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	5 – 36‰
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all

Table E-7 Measurement Quality Objectives – 7-Day Atherinops affinis Larval Survival and Growth Tests	
	times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-8 Measurement Quality Objectives – 10-Day Ampelisca abdita Sediment Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-94/025 or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	Minimum mean control survival of 90% in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Whole sediment toxicity test, static
Size at Test Initiation	3 – 5 mm (no mature males of females)
Replication at Test Initiation	4 (minimum) **(QAPP Element 14)**
Organisms/Replicate	20 **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	10 days
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	20 ± 1.5 °C
Light Intensity	500 – 1000 lux
Photoperiod	Continuous luminance
Test Chamber Size	1 L
Replicate Volume	Sediment volume 175 mL; Overlying water volume 800 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Clean, natural seawater diluted to the appropriate salinity with distilled (or similar) water **(QAPP Element 14)**
Sediment Control	Control sediment listed in method (Control sediment should follow EPA requirements for formulated sediments) **(QAPP Element 14)**
Minimum Sample Volume	2 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	No MSD available
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	6.45 - 7.8 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	n/a
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	Overlying water salinity should be >10‰
Relevant Media	Sediment
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times

Table E-8 Measurement Quality Objectives – 10-Day Ampelisca abdita Sediment Toxicity Tests	
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 14 days (recommended) or <8 weeks (required) @ 0 – 6 °C; dark; Do not freeze

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-9 Measurement Quality Objectives – 10-Day Eohaustorius estuarius Sediment Toxicity Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-94/025 or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	Minimum mean survival of 90% in controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Whole sediment toxicity test, static
Size at Test Initiation	3 – 5 mm (no mature males of females)
Replication at Test Initiation	4 (minimum) **(QAPP Element 14)**
Organisms/Replicate	20 **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	10 days
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	15 ± 1.0 °C
Light Intensity	500 – 1000 lux
Photoperiod	Continuous luminance
Test Chamber Size	1 L
Replicate Volume	Sediment volume 175 mL; Overlying water volume 800 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Clean, 1-µ filtered natural seawater diluted to the appropriate salinity with distilled (or similar) water **(QAPP Element 14)**
Sediment Control	Control sediment listed in method (Control sediment should follow EPA requirements for formulated sediments) **(QAPP Element 14)**
Minimum Sample Volume	2 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	No MSD available
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	6.45 - 7.8 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	n/a
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	Overlying water salinity should be 0 - 34%
Relevant Media	Sediment
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times

Table E-9 Measurement Quality Objectives – 10-Day Eohaustorius estuarius Sediment Toxicity Tests	
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 14 days (recommended) or <8 weeks (required) @ 0 - 6 °C; dark; Do not freeze

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-10 Measurement Quality Objectives – 48-Hour Haliotis rufescens Larval Development Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 (Test Method 995) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥80% normal shell development in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	n/a
Replication at Test Initiation	5 – 10 per mL **(QAPP Element 14)
Organisms/Replicate	5 **(QAPP Element 14)
Food Source	Do not feed
Renewal Frequency	None
Test Duration	48 h
Endpoints	Normal shell development
Test Conditions	*Recommended***
Temperature Range	15 ± 1.0 °C
Light Intensity	10 µE/m^2/s or 50 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	600 mL
Replicate Volume	200 mL or per method **(QAPP Element 14)
Feeding Regime	Do not feed
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water **(QAPP Element 14)
Minimum Sample Volume	2 L for one-time grab sample **(QAPP Element 11)
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<20% MSD
Reference Toxicant Results	Larval development NOEC (statistical significant effect) must be <56 µg/L zinc
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.5 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	31 - 36‰
Relevant Media	Water column, pore water
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C

Table E-10 Measurement Quality Objectives – 48-Hour Haliotis rufescens Larval Development Tests	
Holding Time	< 48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-11 Measurement Quality Objectives – 7-Day Holmesimysis costata Growth and Survival Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 (Test Method 1007.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥75% survival, average dry weight ≥0.40 µg in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static renewal
Age at Test Initiation	3 - 4 days post-hatch juveniles
Replication at Test Initiation	5 **(QAPP Element 14)**
Organisms/Replicate	5 **(QAPP Element 14)**
Food Source	Newly hatched *Artemia* nauplii (< 24 hours old)
Renewal Frequency	75% renewal at 48hoursand 96 h
Test Duration	7 days
Endpoints	Survival and biomass
Test Conditions	*Recommended***
Temperature Range	15 ± 1.5 °C
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	1000 mL
Replicate Volume	200 mL **(QAPP Element 14)**
Feeding Regime	Twice per day
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water **(QAPP Element 14)**
Minimum Sample Volume	3 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Elememt 7**
Minimum Significant Difference	<40% MSD for survival and <50 µg MSD for growth
Reference Toxicant Results	Survival and growth NOECs must be <100 µg/L with zinc
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, salinity and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.5 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	32 - 36‰
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times

Table E-11 Measurement Quality Objectives – 7-Day Holmesimysis costata Growth and Survival Tests	
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours @ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-12 Measurement Quality Objectives – 48-hour Mytilus galloprovincialis Embryo-Larval Development Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥50% survival, ≥90% of those must have normal shell development
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	Within 4 hours of fertilization
Replication at Test Initiation	4 **(QAPP Element 14)**
Organisms/Replicate	150 – 300 (15-30/mL) **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	48 h
Endpoints	Survival of normal live prossidoconch larvae
Test Conditions	*Recommended***
Temperature Range	15 ± 1.5 °C
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	20 mL
Replicate Volume	10 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water **(QAPP Element 14)**
Minimum Sample Volume	1000 mL for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<25% MSD
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	>4.0
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	28 - 36‰
Relevant Media	Water column, pore water
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours @ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-13: Measurement Quality Objectives – 96-Hour Strongylocentrotus purpuratus Embryo Development Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥80% normal shell development in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	Not available
Replication at Test Initiation	250 embryos **(QAPP Element 14)**
Organisms/Replicate	4 **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	96 h
Endpoints	Normal development; survival can be included
Test Conditions	*Recommended***
Temperature Range	15 ± 1.0 °C
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	30 mL
Replicate Volume	10 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water
Minimum Sample Volume	1 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<25% MSD
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.5 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	32 - 36‰
Relevant Media	Water column, pore water
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-14 Measurement Quality Objectives – 20-Minute *Strongylocentrotus purpuratus* Fertilization Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥70% egg fertilization and appropriate sperm counts in controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	n/a
Replication at Test Initiation	4 **(QAPP Element 14)**
Organisms/Replicate	~1,120 eggs from not more than four females and <3,360,000 sperm from not more than four males per test tube **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	40 min (20 min plus 20 min)
Endpoints	Fertilization of egg
Test Conditions	*Recommended*
Temperature Range	12 ± 1.0 °C
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	16 x 100 or 16 x 125 mm
Replicate Volume	5 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water **(QAPP Element 14)**
Minimum Sample Volume	1 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<25% MSD
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 9.1 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	31 - 36‰
Relevant Media	Water column, pore water
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table E-15: Measurement Quality Objectives – 48-Hour Macrocystis pyrifera Germination and Germ-Tube Length Tests	
Method Recommendation – QAPP Element 13	
EPA/600/R-95/136 (Test Method 1009.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements – QAPP Element 13	
Parameter	*Criteria*
Test Acceptability Criteria*	≥70% germination in the controls, ;≥10 µm germ-tube length in the controls
Data Qualification – QAPP Element 16 (unless otherwise noted)	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	n/a
Replication at Test Initiation	5 **(QAPP Element 14)**
Organisms/Replicate	7500 spores/mL of test solution **(QAPP Element 14)**
Food Source	Do not feed
Renewal Frequency	None
Test Duration	48 h
Endpoints	Germination and germ-tube length
Test Conditions	*Recommended***
Temperature Range	15 ± 1.0 °C
Light Intensity	50 ± 10 µE/m^2/s
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	600 mL
Replicate Volume	200 mL **(QAPP Element 14)**
Feeding Regime	Do not feed
Laboratory Control Water	Dilution water should be 1-µ filtered natural seawater of hyper-saline brine prepared from uncontaminated natural seawater plus reagent water **(QAPP Element 14)**
Minimum Sample Volume	2 L for one-time grab sample **(QAPP Element 11)**
Sensitivity	*Performance Criteria* – **QAPP Element 7**
Minimum Significant Difference	<20% MSD
Reference Toxicant Results	NOEC must be <35 µg/L in the reference toxicant test
Water Chemistry – QAPP Element 14	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, salinity, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Daily Water Chemistry	One temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.5 mg/L
Initial pH Range	6.0 - 9.0
Sample Handling/Collection – QAPP Element 12	
Test Parameter	*Recommended Conditions*
Species' Salinity Tolerance	32 - 36‰
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C

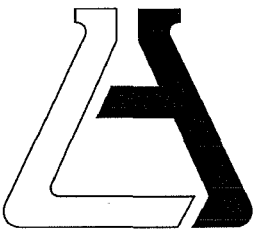
Table E-15: Measurement Quality Objectives – 48-Hour Macrocystis pyrifera Germination and Germ-Tube Length Tests	
Holding Time	< 48hours@ 0 - 6 °C; dark

* Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

** Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Appendix F

Associated Laboratories Quality Assurance Manual (Revision 7/2010)



QUALITY ASSURANCE MANUAL

Revision 7/2010

Effective July 2010

Quality Assurance Guidelines Applicable
to all Chemical Testing

ASSOCIATED LABORATORIES
806 N. BATAVIA
ORANGE, CA 92868
714-771-6900

SIGNATURES AND APPROVALS:

PRESIDENT:

Tito Parola — Date: 7/6/2010

VICE PRESIDENT:

Robert Webber — Date: 7/6/2010

VICE PRESIDENT, TECHNICAL DIRECTOR:

Edward S. Behare, PhD — Date: 7/6/10

MANAGER OF QUALITY ASSURANCE:

Hongling Cao — Date: 7/6/2010

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APPENDICES

MANAGEMENT QUALITY POLICY STATEMENT

It is the policy of Associated Laboratories to provide all clients with test results that are accurate and legally defensible. Associated Laboratories management is committed to good professional practices and quality in environmental testing and calibration as documented in the Quality Assurance Manual and all applicable NELAC standards.

This policy has the full support of Management and must be accomplished with the cooperation of all employees. All personnel concerned with environmental testing and calibration activities within the laboratory are required to familiarize themselves with the quality documentation and implement the policies and procedures in their work.

ORGANIZATION AND MANAGEMENT STRUCTURE

Associated Laboratories is a privately owned, independent laboratory incorporated in California (DePar, Inc.). The laboratory is actively managed by three directors. The laboratory is organized into Departments as follows:

1. Sample Receiving
2. Sample Custodian and Sample Storage
3. General Chemistry
4. Metals (ICP/AA)
5. Pesticides Analysis
6. Hydrocarbons Analysis
7. Volatile Organic Compounds GCMS
8. Semi-Volatile Organic Compounds GCMS
9. Microbiology
10. Fish Bioassay
11. TOC / Radioactivity
12. Sampling and Sample Pickup
13. QA Department

Each Department is managed by a Department Supervisor who reports to the Laboratory Directors.

The Quality Assurance Department operates independently from the other Departments. The Quality Assurance Director reports directly to the Laboratory Directors.

An Organization Chart is attached in Appendix G.

The Directors manage all operations of the laboratory and are the official signatories for all Laboratory Analysis Reports and other official documents of the Laboratory. The QA Director is the official signatory for Quality Assurance documents and may also sign Laboratory Analysis Reports. The signature page of this document includes all approved laboratory signatories.

All personnel are employees of the laboratory. Where contracted and additional technical and key support personnel are used, the laboratory ensures that such personnel are supervised and competent and that they work in accordance with the laboratory' s quality system.

RELATIONSHIP BETWEEN MANAGEMENT, TECHNICAL OPERATIONS, SUPPORT SYSTEMS AND THE QUALITY SYSTEM

The Laboratory Directors manage all operations of the laboratory and all technical operations support systems. The Quality System operates independently of other laboratory operations and reports directly to the Laboratory Directors.

JOB DESCRIPTIONS OF KEY STAFF

The job descriptions of key staff are attached in Appendix A.

FACILITIES, MAJOR EQUIPMENT AND SERVICES

ASSOCIATED LABORATORIES is located in two buildings:

Main Office and Laboratory: 806 North Batavia Street, Orange, CA 92868

Annex: 1108 West Barkley, Orange, CA.

Telephone: 714-771-6900
Fax No: 714-538-1209

Associated Laboratories has been in operation for over 80 years and is currently employing 75+ personnel.

Our main facility occupies 10,000 square feet, 8,000 square feet is laboratory space and 2,000 square feet office space. The Annex occupies 7,500 square feet and is maintained free of organic solvent vapors for analysis of volatile organic compounds. The annex also contains the microbiology and metals laboratories.

Refrigeration and freezers are provided for sample storage according to the method requirements. Samples are always stored in refrigerators and freezers separate from analytical standards to avoid cross contamination.

The laboratory monitors, controls and records environmental conditions as required by the relevant specifications, methods and procedures or where they influence the quality of the results. If specific environmental conditions are specified in a test method or by a regulation then the environmental conditions are documented on the sample preparation documents or separate monitoring document. Special procedures are prepared when necessary to meet environmental conditions.

The latest equipment inventory is attached (Appendix D)

ACCREDITATIONS

Associated Laboratories is accreditated by the following agencies:

- State of California, Department of Health Services, Environmental Laboratory Accreditation Program, Berkeley, Certificate No. 1338 .
- State of Hawaii, Department of Health, Safe Drinking Water Branch.
- State of Nevada, Department of Human Resources, Health Division, Bureau of Licensure and Certification.
- U.S. Army Corps of Engineers, Dept. of the Army, Omaha, NE.
- U.S. Food and Drug Administration, Department of Health and Human Services.

A listing of all test methods accredited by California is attached in Appendix K.

PERSONNEL QUALIFICATIONS

The laboratory management shall ensure the competence of all who operate specific equipment, perform environmental tests and/or calibrations, evaluate results, and sign test reports and calibration certificates. The laboratory management shall be responsible for checking the qualification of person before hiring based on the minimal level of qualification, experience and skills necessary for all positions in the laboratory (see Appendix A, Laboratory Job Descriptions). In addition to education and/or experience, basic laboratory skills such as using a balance, colony counting, aseptic or quantitative techniques shall be considered. Any falsification or inaccuracy of the employment application or educational diploma will be cause for the termination of employment. A copy of educational diplomas or certificates will be required to be included in the personnel file of new employees.

Records of personnel qualifications, training and experience are maintained in the employee training files maintained by the QA Department. The Laboratory training program is detailed below.

PERSONNEL TRAINING PROGRAM

All personnel shall be responsible for complying with all quality assurance/quality control 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, quality assurance/quality control procedures and records management.

All current as well as new technical personnel are required to become familiar with the the following documents:

Laboratory Safety Manual - A formalized laboratory safety training course has been established, including a video discussion of safety and a written test. An attendance log and the test results are filed in the Employee Safety Documentation File. Each employee is also given a copy of the Laboratory Safety Manual.

Quality Assurance Manual - A copy of the Quality Assurance Manual is available in all departments. All employees are required to understand and follow the appropriate Quality Assurance guidelines and procedures.

Standard Operating Procedures - Standard Operating Procedures (SOP's) are available to all analysts for most analytical methods. For analytical methods, the SOP provides details regarding specific procedures and QA acceptance limits. SOP's are also available for most laboratory operations. Analysts are required to understand and follow the standard method requirements as detailed in the SOP for each analytical method. Each SOP is reviewed at least annually by the analysts and department manager to insure that the SOP accurately describes the analytical procedure. All SOP's are approved by the department manager and the QA Director.

The Department Supervisor is responsible for ensuring that all department personnel read and understand the Safety Manual, QA Manual, standard methods and appropriate SOP's. Completion of these requirements and all other specific training are documented in the employee training records. Training records are filed in the employee training file maintained for each technical employee. Successful completion of training courses and other formalized training are also filed in the employee training files.

In addition, the following training is conducted:

Technicians are also given on-the-job training for each new method or procedure by the supervisor or an experienced analyst designated by the supervisor. During the training period the supervisor or experienced analyst continues to be responsible for all analytical results produced by the trainee. This training is also documented on the employee's training record.

Competence to perform each analysis is determined by the supervisor's direct evaluation and successful analysis of Lab Control Samples and/or Performance Evaluation Samples.

Periodically, analysts are encouraged to attend outside classes or other relevant training to increase their job knowledge. Attendance at these courses/seminars are also recorded on the training record.

Training Files

Training files for each employee are maintained by the QA Department. The training files contain training logs, sign-off sheets for the QA Manual, Standard Operating Procedures and Initial and Continuing Demonstration of Capability Certificates and supporting documentation. The training files are updated on an annual basis. Annually each employee signs a form that demonstrates that they have read, understood, and is using the latest version of the laboratory's in -house quality documentation, which relates to his/ her job responsibilities.

Demonstration of Capability

For NELAP certified tests an Initial Demonstration of Capability (IDOC) must be performed prior to using any test method, and at any time there is a change in instrument type, personnel or test method (NELAC, Quality Systems, Appendix C, July 1, 2003). The Demonstration of Capability is updated annually, and a signed certification is placed in the employee training file for each method. When a work cell is employed, the performance of the group is linked to the training record of the individual members of the work cell.

The analyst training on each method shall be considered up to date if the employee training file contains a certification that the analyst has read, understood and agreed to perform the most recent version of the test method (the approved method or standard operating procedure as defined by the laboratory document control system) and documentation of continued proficiency by at least one of the following once per year:

a. acceptable performance of a blind sample (single blind to the analyst);

b. another demonstration of capability;

c. successful analysis of a blind performance sample on a similar test method using the same technology (e.g., GC/MS volatiles by purge and trap for Methods 524.2, 624 or 5035/8260) would only require documentation for one of the test methods;

d. at least four consecutive laboratory control samples with acceptable levels of precision and accuracy; or

e. if a-d cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.

f) A certification statement is completed to document the completion of each demonstration of capability. A copy of the certification statement is retained in the personnel records of each affected employee.

Ethics Policy and Data Integrity Training

To prevent Data Fraud/Inappropriate Practices, all technical personnel are trained in ethical and legal responsibilities. Examples of Data Fraud are identified below:

a) Inappropriate use of manual integrations to meet calibration or method QC criteria would be considered fraud. For example, peak shaving or peak enhancement are considered fraudulent activities if performed to meet QC requirements.

b) Time travel of analyses to meet method holding time requirements.

c) Falsification of results to meet method QA requirements.

d) Reporting of results without analyses to support the results.

e) Selective exclusion of data to meet QC criteria (i.e. initial calibration points dropped without technical or statistical justification)

f) Misrepresentation of laboratory performance by presenting calibration data or QC data within data reports which are not linked to the data set reported.

g) Notation of matrix interference as basis for exceeding acceptance limits (typically without implementing corrective actions) in interference-free matrices (e.g. MB or LCS)

The potential punishments and penalties for improper, unethical or illegal actions include immediate dismissal, and possible legal court action.

All technical personnel are required to sign an Ethics and Data Integrity Agreement Form. These forms are filed in the QA Office.

The Ethics and Data Integrity Training and Agreement Form is updated annually for each employee.

Internal audits are performed periodically which include monitoring of data integrity. Any allegations of improper reporting or manipulation of data are investigated promptly.

DOCUMENT CONTROL AND RECORD KEEPING

All documents relating to laboratory analyses and reporting are kept a minimum of seven years. After that time the records will be destroyed, unless special arrangements are made.

The laboratory maintains a tracking system for Standard Operating Procedures, MDL determinations, training documentation and corrective actions. These records are kept by the QA Department.

A Lab Request is created by the Laboratory LIMS system for each group of samples received from a client to enable organization and tracking of the analyses and final reporting. All analytical results are reported in the LIMS database system, including date of analysis and analyst initials. All documentation other than bound laboratory notebooks relating to the analyses of a client's samples including a copy of the final report, Chain of Custody, all sample preparation worksheets and analytical raw data is attached to each Lab Request. Lab Requests including all relevant data are filed for a minimum of seven years. Other relevant analysis data may be written in bound laboratory notebooks which are maintained in each laboratory department. All calibration data and other relevant data such as calibration checks, which may apply to multiple Lab Requests are filed and retained in the individual departments.

Corrections

All generated data is recorded in permanent ink. Entries in records shall not be obliterated by methods such as erasures, overwritten files or markings. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall sign (or initial) and date the correction.

The document control system establishes procedures to ensure that all records required under the laboratory certification are retained. Procedures for control and maintenance of documentation through a document control system ensures that all standard operating procedures (SOPs), manuals, or documents clearly indicate the time period during which the procedure or document was in force.
Document control procedures are defined in the Standard Operating Procedure for Document Control.

REVIEW OF CLIENT PROJECTS

New projects and contracts are reviewed by laboratory management to ensure that the laboratory has the technical capability and resources to meet the requirements. Any potential conflict of interest or other problem noted in the review is discussed with the client prior to acceptance of the contract or samples. Refer to the SOP for Project Management.

The laboratory will afford clients or their representative 's cooperation to clarify the client' s requests and monitor the laboratory 's performance in relation to the work performed.

Client confidentiality is a high priority and the laboratory will ensure confidentiality to each client's work while providing service to other clients.

PROTECTION OF CLIENT CONFIDENTIALITY

Associated Laboratories recognizes the importance of client confidentiality. Each Lab Report contains the following statement: "The reports of Associated Laboratories are the confidential property of our clients and may not be reproduced or used for publication in part or in full without our written permission. This is for the mutual protection of the public, our clients, and ourselves." Analysis results are released to third parties only with the permission of the client.

Confidentiality agreements may be signed by Laboratory management to maintain confidentiality of analysis results between the Laboratory and the client.

SAMPLE RECEIVING AND CUSTODY

All sample receiving and log-in is handled by the Sample Receiving Department.

1. All samples are assigned a laboratory identification number during the log-in process. This number is a unique identifier assigned by the laboratory LIMS system.

2. All samples received from a client on the same day on the same Chain of Custody (COC) are normally grouped together in a unique Laboratory Request Number. The Laboratory Request Number is also assigned by the laboratory LIMS system.

3. A Laboratory Request Summary is prepared which includes: date, client name, client sample ID, corresponding laboratory sample number, all analyses to be performed, laboratory area designations and other special instructions.

Procedures for sample receiving and chain of custody for samples are detailed in the Sample Receiving SOP, attached to this document as Appendix B.

SAMPLE HANDLING PRACTICES AND CHAIN OF CUSTODY

1. After samples are logged in, they are transferred to the Sample Custodian.

2. All transfer of samples out of and into storage are documented on the Sample Control Record Book.

3. *Samples are stored according to the conditions specified by preservation protocols. Samples which require thermal preservation are stored under refrigeration which is +/-2 of the specified preservation temperature unless method specific criteria exist. For samples with a specified storage temperature of 4°C, storage at a temperature above the freezing point of water to 6°C is considered acceptable.*

4. Samples are stored away from all standards, reagents, food and other potentially contaminating sources. Samples are stored in such a manner to prevent cross contamination.

5. Sample fractions, extracts, leachates and other sample preparation products are stored according to #3 above or according to specifications in the test method.

6. The temperature of each refrigerator used for sample storage is monitored each working day, and recorded on the Temperature Control Record. This record is attached to each refrigerator. When the record is completely filled in, it is filed for future reference. If the temperature is out of control limits, the laboratory manager must be notified immediately.

7. Unless notified in writing, all samples will be discarded by appropriate disposal protocol 30 days from the date reported. Samples are discarded in the designated hazardous waste disposal containers. These containers are picked up periodically by a hazardous waste disposal company.

SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

In general, the shorter the time that elapses between collection of a sample and the analysis, the more reliable will be the analytical results. Preservation is necessary when the interval between sample collection and analysis is long enough to produce changes in either the concentration or the physical state of the constituent to be measured. Preservation of samples is specified in many EPA methods and when possible is confirmed by the laboratory during the sample log in process. The holding time of an analysis is the maximum time that samples may be held before analysis for the analysis to be considered valid. Each department is familiar with the holding times for sample analysis which they perform. The supervisor is responsible for ensuring that these holding times are met for all analyses. If holding times are not able to be met, then every effort is made to notify the client and if necessary send the samples to another laboratory.

Appendix C contains sample container guidelines and holding times as specified by the USEPA for environmental samples.

LABORATORY LIMS SYSTEM

Laboratory Information Management System (LIMS)

The laboratory information management system (LIMS) is a client-server network of computers used to login samples, track samples during and after analysis, and report the final results to the client. In addition the LIMS software which is database driven is able to generate historical reports and trends and generate other types of reports such as electronic deliverables which are increasingly used by clients to transfer data into their own computer systems without having to do manual data entry. The LIMS system is also used to track laboratory data such as detection limits (MDL) and reporting limits for analytes.

The hardware components of the LIMS include two servers and approximately *fifty* PC compatible computers running Windows 98 - *VISTA*. The LIMS Software consists of Varian Starlims 7.0 with an Oracle 7 database system.

Security consists of a password login system and nightly tape backups. All reports are reviewed and signed by designated managers before release to the client. Tracking reports are generated daily from the LIMS system to insure timely analysis and reporting of all client samples.

Electronic Delivery Capabilities - laboratory data can be delivered to the client in electronic data deliverable (EDD) formats such as: spreadsheet (Lotus, Excel); standard database file formats (dB, Paradox, etc); delimited or fixed field formatted ASCII; or word processing formatted. The data files can be transmitted to the client either by diskette or directly using e-mail or FTP protocols.

STANDARD TEST METHODS

Essentially all laboratory analyses are conducted using published standard methods. Standard method sources which are available for use are listed below.

Analytical Standard Procedures for Environmental Analyses:

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79- 020,3/1983

Standard Methods for the Examination of Water and Wastewater (American Public Health Association)

40 CFR, Appendix A to part 136-Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (600-series methods)

Methods for the Determination of Organic Compounds in Drinking Water, Supplement III, EPA-600/R-95/131, August 1995. (500-series methods)

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993

Methods for the Determination of Metals in Environmental Samples, Supplement I EPA/600/R-94/111, May 1994

Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition.

NELAC Quality Systems *Approved June 5, 2003, effective July 1, 2003.*

Analytical Standard Procedures for Food, Feeds, Oil/Fats and Pharmaceuticals:

Association of Official Analytical Chemists (AOAC).

The American Oil Chemists' Society (AOCS).

Methods of the U.S. Department of Agriculture (USDA).

FDA Pesticide Analytical Manual (PAM).

US Pharmacopeia/National Formulary (USP/NF).

Food Chemicals Codex (FCC).

American Society for Testing and Materials (ASTM)

Note:

A listing of all environmental test methods for which Associated Laboratories is accredited by California is attached in Appendix H.

Methods Not Covered by Standard Methods

When it is necessary to use methods not covered by standard methods, these methods are subject to agreement with the client. This agreement includes a clear specification of the client' s requirements and the purpose of the environmental test and/ or calibration. The method is validated appropriately before use.

STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOP) are available for most methods to indicate specific procedures, instrumentation, data needs and laboratory data quality requirements. Standard Operating Procedures are available to the analyst and are updated at least annually to insure

that method and quality assurance requirements are being met. The original version of the SOPs are filed in the QA Department and controlled copies made available to the department. An inventory list of all current SOP's is maintained by the QA Department and are listed in Appendix H.

Each test method shall include or reference where applicable:

1) identification of the test method;
2) applicable matrix or matrices;
3) detection limit;
4) scope and application, including components to be analyzed;
5) summary of the test method;
6) definitions;
7) interferences;
8) safety;
9) equipment and supplies;
10) reagents and standards;
11) sample collection, preservation, shipment and storage;
12) quality control;
13) calibration and standardization;
14) procedure;
15) calculations;
16) method performance;
17) pollution prevention;
18) data assessment and acceptance criteria for quality control measures;
19) corrective actions for out-of-control data;
20) contingencies for handling out-of-control or unacceptable data;
21) waste management;
22) references; and,
23) any tables, diagrams, flowcharts and validation data.

TRACEABILITY OF MEASUREMENTS

Traceability of measurements is achieved by using standards for calibration and calibration checks which are traceable to primary NIST standards. Certificates of Analysis or purity are kept on file for each standard purchased, showing the traceability of the standard to a primary NIST standard. All balances are calibrated and certified annually using NIST certified weights. Thermometers are also calibrated at least annually using a thermometer certified against an NIST temperature standard.

When standard solutions, spiking solutions and calibration check solutions are prepared, the following information is recorded in a Standards Traceability Notebook maintained by each Laboratory Department:

a. The identifying name of the Working Standard consists of the Working Standard Identification and the date of preparation. This name must be unique and apply to only one standard solution, such that the standard can be unequivocally traced back to the

date of preparation, analyst and identification of all original standards and reagents used to prepare the standard.

b. Date and analyst initials

c. The name, manufacturer and lot number of each analytical standard, reagent and acid used in the solution.

d. The volume of each standard, reagent and acids used, and the final volume of the solution.

e. The calculated concentration of all analytes in the final solution.

The final standard solutions are transferred to a storage container and labeled with the identifying Working Standard ID, date of preparation, expiration date, concentration and initials of the analyst who prepared the solution.

All commercially prepared standards have a maximum expiration date of one year from the date of receipt or other expiration date as established and documented by the supplier.

Reagents are purchased from established commercial suppliers as specified by the laboratory standard methods or SOP. Reagents are stored at the appropriate temperature (refrigeration, freezing, room temp) as specified by the supplier.

Lot numbers of reagents are recorded on sample preparation log sheets or in analysis log books to enable traceability.

CALIBRATION AND VERIFICATION PROCEDURES

Initial Calibrations

Criteria for Initial Calibrations are specified in the applicable method and Standard Operating Procedure for each method.

The following items are essential elements of initial instrument calibration:

a) The details of the initial instrument calibration procedures including calculations, integrations, acceptance criteria and associated statistics are included or referenced in the test method SOP.

b) Sufficient raw data records are retained to permit reconstruction of the initial instrument calibration, e.g., calibration date, test method, instrument, analysis date, each analyte name, analyst's initials or signature; concentration and response, calibration curve or response factor; or unique equation or coefficient used to reduce instrument responses to concentration.

c) Sample results must be quantitated from the initial instrument calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method, or program.

d) All initial instrument calibrations must be verified with an **Initial Calibration Verification** standard (ICV) obtained from a second manufacturer or lot number. Standards for the initial calibration are traceable to a national standard such as NIST (National Institute of Standards and Technology), when available.

e) Criteria for the acceptance of an initial instrument calibration must be established, e.g., correlation coefficient or relative percent difference. The criteria used must be appropriate to the calibration technique employed.

f) Results of samples outside of the concentration range established by the initial calibration must be reported with defined qualifiers or flags or explained in the case narrative. The lowest calibration standard must be above the detection limit (MDL).

g) If the initial instrument calibration results are outside established acceptance criteria, corrective actions must be performed and all associated samples reanalyzed. If reanalysis of the samples is not possible, data associated with an unacceptable initial instrument calibration are reported with appropriate data qualifiers.

h) Calibration standards must include concentrations at or below the regulatory limit/decision level, if these limits/levels are known by the laboratory, unless these concentrations are below the laboratory's demonstrated detection limits.

i) The number of points for establishing the initial instrument calibration are determined by the method and regulatory guidelines and are stated in the SOP for each method.

Continuing Calibration Verification (CCV)

When an initial instrument calibration is not performed on the day of analysis, the validity of the initial calibration is verified prior to sample analyses by a continuing instrument calibration verification with each analytical batch. The following items are essential elements of continuing instrument calibration verification:

a) The details of the continuing instrument calibration procedure, calculations and associated statistics must be included or referenced in the test method SOP.

b) A continuing instrument calibration verification must be repeated at the beginning and end of each analytical batch. The concentrations of the calibration verification shall be varied within the established calibration range. If an internal standard is used, only one continuing instrument calibration verification must be analyzed per analytical batch.

c) Sufficient raw data records must be retained to permit reconstruction of the continuing instrument calibration verification, e.g., test method, instrument, analysis date, each analyte name, concentration and response, calibration curve or response factor, or unique equations or coefficients used to convert instrument responses into concentrations. Continuing calibration verification records must explicitly connect the continuing verification data to the initial instrument calibration.

d) Criteria for the acceptance of a continuing instrument calibration verification must be established, e.g., relative percent difference.

e) If the continuing instrument calibration verification results obtained are outside established acceptance criteria, corrective actions must be performed. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then either the laboratory has to demonstrate performance after corrective action with two consecutive successful calibration verifications, or a new initial instrument calibration must be performed. If the laboratory has not demonstrated acceptable performance, sample analyses shall not occur until a new initial calibration curve is established and verified. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

1) when the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

2) when the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

METHOD DETECTION LIMITS

Method Detection Limits (MDL) are normally determined by taking seven or more aliquots of a sample containing the compounds of interest at a concentration 1 to 5 times the estimated detection limit and processing each sample through the entire analytical method. The MDL is calculated from the standard deviation of the replicate measurements (MDL = 3.143 x Standard Deviation for seven replicate measurements). MDL studies for each method are normally performed at least annually or when a major modification is made to the method or instrumentation used for analysis. Reference: 40 CFR, Ch. 1, Part 136, Appendix B (7-1-86 Ed.).

Method Detection Limits are updated in the laboratory information management system (LIMS) and tracked by the QC Department. The SOP for determination of MDL is attached (Appendix E).

PROCEDURES FOR REPORTING ANALYTICAL RESULTS

Final Reports issued to clients contain at a minimum the following information:

1. The report identification (Lab Request number) and page number is printed at the bottom of each page.

2. The Cover Page(s) include the Laboratory name and address, phone number, name and signature of person authorizing the report. The Cover page(s) also include the Client name,

address, Client ID number, project identification, contact or project manager, date of sample receipt at the laboratory and a cross-reference of lab identification numbers and client sample identifications. The Cover Page includes the statement: "*The reports of the Associated Laboratories are confidential property of our clients and may not be reproduced or used for publication in part or in full without our written permission. This is for the mutual protection of the public, our clients, and ourselves.*"

3. The Lab Report pages detail the date and time of sample collection, the test results, analysis units, methods of analysis, detection limits, dates of analyses and analyst initials. The time of analysis is reported when the holding time for preparation or analysis is 72 hours or less.

4. The original copy of the chain-of-custody is attached to the final report

5. A copy of the *Sample Receiving Checklist is attached to the final report.*

6. For NELAC reports and data packages, a case narrative is attached. The case narrative describes where the analyses were performed if not performed at the main address of the laboratory. Normally all analyses for volatile organic chemicals, organic volatiles in air, metals and microbiology are performed in the laboratory annex, located at 1108 West Barkley (one half block from the main laboratory building.

7. The case narrative also lists the number and identification of all discrete pages in the report and the total number of pages in the complete report.

8. A statement is included in the Narrative that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

9. In addition to the requirements listed above, test reports shall, where necessary for the interpretation of the test results, include the following:

> *a) deviations from (such as failed quality control), additions to, or exclusions from the test method, and information on specific test conditions, such as environmental conditions and any non-standard conditions that may have affected the quality of results, including the use and definitions of data qualifiers;*
>
> *b) where relevant, a statement of compliance/non-compliance with requirements and/or specifications, including identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature;*
>
> *c) where applicable, a statement on the estimated uncertainty of measurement; information on uncertainty is needed in test reports when it is relevant to the validity or application of the test results, when a client's instruction so requires, or when the uncertainty affects compliance to a specification limit;*
>
> *d) where appropriate and needed, opinions and interpretations;*
>
> *e) additional information which may be required by specific methods, clients or groups of clients;*

f) clear identification of numerical results with values outside of quantitation limits.

10. In addition to the requirements listed above, test reports containing the results of sampling shall include the following, where necessary for the interpretation of test results:

a) the date of sampling;

b) unambiguous identification of the substance, material or product sampled (including the name of the manufacturer, the model or type of designation and serial numbers as appropriate);

c) the location of sampling, including any diagrams, sketches or photographs;

d) a reference to the sampling plan and procedures used;

e) details of any environmental conditions during sampling that may affect the interpretation of the test results;

f) any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

DATA REVIEW

All data generated from each analysis are recorded either in a bound laboratory notebook or on worksheets which are attached to the Lab Request package.

Copies of the lab notebook page(s), worksheets, instrument readouts, chromatograms, QC forms and other data pertinent to the analysis are attached to the Laboratory Request Sheet.

In addition to the analytical results and calculations, the manufacturer and lot number of all reagents used must be included. Also the assigned code numbers of all prepared reagent and standard solutions are included for traceability purposes.

The review process includes at least three separate review stages:

The analyst reviews all data and calculations and also checks data for completeness and that any special requirements have been met.

The Lab Supervisor reviews the results and initials the report to signify his/her approval.

After the final report is completed, the Laboratory Manager or signatory of the report reviews the final report and signs the report to signify his/her final approval.

The QA Department reviews a proportionate amount of all QC data generated (at least ten percent) and also reviews all corrective action reports that are submitted by the Departments.

A copy of the test report and all supporting raw data for each Lab Request are maintained on file by the laboratory.

The minimum period of retention for the records is seven (7) years.

PROCEDURE FOR HANDLING CUSTOMER'S COMPLAINTS

Associated Laboratories encourages feedback from customers. Complaints such as improper billing or incorrect sample identifications are normally handled by client project managers, who make every effort to resolve the problem as quickly as possible. Where the complaint involves problems which can not be readily corrected, then the customer's complaints are recorded on a Customer Complaint Form which contains the following information:

Date of complaint
Name of company
Name of person submitting the complaint
How the complaint was submitted
Name of person receiving complaint by phone
Nature of complaint
Department(s) involved

The customer's complaint form is submitted to the department(s) involved for investigation and resolution of the complaint.

The results of the investigation and resolution of the complaint are recorded on the complaint form, signed and dated by the individual handling the complaint and submitted to the Lab Manager to be reviewed and approved.

The customer is notified of the results of the investigation and resolution of the complaint by the Lab Manager or by a person authorized by the Lab Manager, either verbally, by phone, or in the form of a letter.

The Complaint Form and all other documents pertinent to the complaint, including emailed communications and the investigations and corrective actions taken by the laboratory, are filed in the Complaint File maintained by the QA Department.

QUALITY ASSURANCE PROCEDURES

The laboratory has established quality control procedures for monitoring the validity of environmental tests and calibrations undertaken. The resulting data is recorded in such a way that trends are detectable and, where practicable, statistical techniques can be applied to the reviewing of the results. This monitoring includes the following:

a) regular use of certified reference materials and/or internal quality control using secondary reference materials (Laboratory Control Samples);

b) participation in inter-laboratory comparison or proficiency-testing programs (WS, WP and Hazardous Waste PE samples);

c) replicate tests or calibrations using the same or different methods;

d) retesting of retained samples;

e) correlation of results for different characteristics of a sample (for example, total phosphate should be greater than or equal to orthophosphate).

Routine Quality Control Samples

Quality Control samples are normally analyzed with each batch of samples for each analysis. For environmental samples the Quality Control samples include a Method Blank (MB), Laboratory Control Sample (LCS) and a Matrix Spike and Matrix Spike Duplicate. These QC samples are included in each batch of twenty samples or less for each matrix (frequency equivalent to 5% of all samples analyzed). If spike analyses are not feasible, a duplicate sample analysis is generally performed (eg TDS, dissolved oxygen, turbidity).

1. The Method Blank (negative control sample) is used to assess the preparation batch for possible contamination during the preparation and processing steps. The method blank is processed along with and under the same conditions as the associated samples to include all steps of the analytical procedure. Procedures are included in the method to determine if a method blank is contaminated. Any affected samples associated with a contaminated method blank are reprocessed for analysis or the results reported with appropriate data qualifying codes.

2. The Laboratory Control Sample (LCS) (Positive Control Sample) is used to evaluate the performance of the total analytical system, including all preparation and analysis steps. Results of the LCS are compared to established criteria and, if found to be outside of these criteria, indicate that the analytical system is "out of control". Any affected samples associated with an out of control LCS are reprocessed for re-analysis or the results reported with appropriate data qualifying codes. The Laboratory Control Sample (LCS) is run at the same frequency as QC samples for each type of matrix. The LCS is obtained when possible from a source external to the laboratory. The LCS may be prepared by the laboratory using certified standards from a different source or a different lot number from the source used for calibration standards. For NELAP accredited tests, all analytes are included in the LCS spike mixture over a two year period.

3. A Matrix Spike and Matrix Spike Duplicate sample (replicate samples) are normally analyzed with each batch of twenty samples or less. Matrix spikes are duplicate aliquots of a sample which are spiked with the analytes of interest and taken through the same analytical procedures. The recovery of the analyte concentration is calculated to indicate the accuracy of the analysis in the sample matrix. The relative percent difference between the Matrix Spike and Matrix Spike Duplicate sample provides a measure of precision of the analyses in the sample matrix. For NELAP accredited tests, all analytes are included in the matrix spike mixture over a two year period.

4. Surrogate spike analyses are performed for all organic analyses when required by the method. Surrogates are used most often in organic chromatography test methods and are chosen to reflect the chemistries of the targeted components of the method. Added prior to sample preparation/extraction, they provide a measure of recovery for every sample matrix. The surrogate spike solution is added to all samples, standards and blanks. The results are compared to the acceptance criteria as published in the mandated test method or laboratory generated acceptance criteria. Results reported from analyses with surrogate recoveries outside the acceptance criteria *must* include appropriate data qualifiers.

5. All other QC requirements (tuning, multiple points calibration, daily calibration check, etc.) are performed as specified in the method.

6. All QC data are to be recorded on the appropriate forms and kept on file by each department. Copies of these forms must be attached to the Lab Requests for all samples associated with that particular QC sample. Accuracy and precision data may be used to generate control charts.

7. Acceptance limits for QC samples are detailed in the Standard Operating Procedure for each method, and may be established by the original reference source or statistical analysis of the historical data for each type of QC sample, method and matrix using control charts.

8. When QC acceptance criteria are exceeded, corrective actions are to be taken as specified in the method or as instructed by the Department Supervisor.

9. Non-conformances such as QA limit failures which cannot be corrected by re-analyses, client requirements which cannot be met or standard method modifications are documentated by initiating a Non-Conformance Document Form (NCD). Appendix F describes the use of the Non-Conformance Document Form.

Other Essential Quality Control Procedures

1. Method capabilities are measured by determination of detection limits and quantitation limits. This is done on an annual basis or more often as needed (page 18).

2. Selection of appropriate formulae to reduce raw data to final results such as regression analysis, comparison to internal/external standard calculations, and statistical analyses is detailed in the method Standard Operating Procedures for each method.

3. Selection and use of reagents and standards of appropriate quality is included in the method Standard Operating Procedures.

4. Measures to assure the selectivity of the test for its intended purpose is assessed on a continuing basis by analysis of QA samples as detailed above.

5. Measures are taken as necessary to assure constant and consistent test conditions (both instrumental and environmental) where required by the test method such as temperature, humidity, light, or specific instrument conditions.

6. All quality control measures are assessed and evaluated on an on-going basis, and quality control acceptance criteria are used to determine the usability of the data.

7. The laboratory will develop acceptance/rejection criteria where no method or regulatory criteria exist.

8. The quality control protocols specified by the laboratory's Standard Operating Procedure for each method is to be followed. The laboratory shall ensure that the essential standards outlined in NELAC, Quality Systems, Appendix D or the mandated methods or regulations (whichever are more stringent) are incorporated into their Standard Operating Procedures. When it is not apparent which is more stringent the QC in the mandated method or regulations is to be followed.

QUALITY ASSURANCE DEPARTMENT FUNCTIONS

Internal Audits and Data Review

Various types of internal audits are performed on Laboratory activities on a routine basis. These audits should reflect as closely as possible, the Laboratory performance under normal operating conditions.

Performance Audits: Evaluation of data reports generated by the laboratory. All technical, clerical and administrative aspects of the data report are reviewed. Errors observed during these ongoing audits are categorized as they relate to the technical accuracy and legal defensibility of data.

Internal audits of each department are conducted at least annually. Routine quality control checks, for example checking laboratory notebooks, daily calibrations, quality control sample frequency are also done on a random basis. Results of internal audits *(including the completed checklist, deficiencies, responses and corrective actions)* are documented in the internal audits files *maintained in the QA Office. The results of internal audits are* reported to the Audit Committee designated by the Laboratory management.

A system audit is the physical inspection and review of the entire laboratory operation to verify compliance with the QA Program objectives as stated in the Laboratory's QA Manual. System audits are conducted periodically by external auditors, such as state regulatory agencies, commercial clients or independent auditors representing these clients or agencies.

In response to deficiencies or recommendations from auditing activities, corrective actions reports are required to document the corrective actions taken to correct the deficiencies. The Laboratory management has established an *internal* audit committee to oversee audit activities and establish corrective actions where necessary. *The internal audit committee members will meet quarterly.All committee meeting minutes and memos will be maintained in the QA Office.*

Internal audit procedures are detailed in the SOP for Internal Audits.

When audit findings cast doubt on the effectiveness of the operations or on the correctness or validity of the laboratory' s environmental test or calibration results, the laboratory will notify

clients in writing if investigations show that the laboratory results may have been affected.

The laboratory will notify clients promptly, in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any calibration certificate, test report or test certificate or amendment to a report or certificate.

External Proficiency Testing and Verification Practices

The QA Department is responsible for organizing Proficiency Testing (PT) Programs, including WS and WP Studies, and other studies as required by accrediting agencies.

Proficiency Testing samples are obtained from NELAP approved external sources on a semi-annual basis. Results must be satisfactory (within acceptance limits) or a corrective action report is initiated. Proficiency Testing samples are analyzed semiannually or more often for all NELAP accredited tests. PT samples for ELAP accredited tests may be analyzed annually or semiannually. To demonstrate proficiency under NELAP guidelines, the laboratory must pass two of the three most recent PT samples for each accredited test.

Corrective Action Reports and Departures from Documented Policies

A Non-Conformance Document (NCD) may be required when certain Quality Control criteria are exceeded in a sample analysis batch.

1. Non-conformances such as a sample exceeding holding time, QA limit failures which can not be corrected by re-analyses, client requirements which cannot be met, or standard method modifications are documented by initiating a Non-Conformance Document Form (NCD). A copy of the NCD Standard Operating Procedure and Form is attached (Appendix F).

2. The NCD form is initiated by the analyst in the event of a sample exceeding holding time, Quality Control sample results outside control limits or other known non-conformance to the analytical method or client requirements. The NCD form may also be initiated by the project manager or department manager in the event client requirements are not met or other analytical problems are discovered.

3. After the NCD Form is initiated, the corrective action, if any, must be agreed upon by the department manager or supervisor and the QA Manager. If appropriate, the procedure for corrective actions starts with an investigation of the root cause(s) of the problem. The potential corrective actions shall be identified, selected and implemented to eliminate the problem and to prevent recurrence. Corrective actions shall be to a degree appropriate to the magnitude and the risk if the problem. This is documented and signed by the department manager in the second part of the NCD Form. The form is then forwarded to the QA Manager.

4. The QA Manager then completes and signs the final part of the form. If necessary, verification of the corrective action is documented in this section. If necessary the results will be monitored to ensure that the corrective actions taken have been effective. All follow-ups shall be completed and documented by the QA office.

5. A copy of the form is included in the affected data package or the client is notified as appropriate. The original is filed in the Corrective Actions File which is maintained by the QA Manager.

When there are deviations from the requirements by the specific method, such as insufficient sample volume, improper preservation, the client will be notified as soon as possible. If the client agrees to the deviation, then an explanation of the deviation or non-compliance is required to be attached to the data package and final report.

Laboratory Standard Operating Procedures and QA Manual

The QA Department is responsible for ensuring that all Laboratory Standard Operating Procedures and the QA Manual are current. A tracking system is in place to ensure that copies of Standard Operating Procedures are controlled such that only current approved versions are in use in the laboratory.

Procedures for tracking SOP documents are detailed in the Standard Operating Procedure for SOPs.

MANAGEMENT REVIEWS

In accordance with a predetermined schedule and procedure, the laboratory's executive management will periodically and at least annually conduct a review of the laboratory's quality system and environmental testing and/or calibration activities to ensure their continuing suitability and effectiveness, and to introduce necessary changes or improvements. The review shall take account of:

a) The suitability of policies and procedures;
b) Reports from managerial and supervisory personnel;
c) The outcome of recent internal audits;
d) Corrective and preventive actions;
e) Assessments by external bodies;
f) The results of inter-laboratory comparisons or proficiency tests;
g) Changes in the volume and type of the work;
h) client feedback;
i) complaints;
j) other relevant factors, such as quality control activities, resources and staff training.
k) Nonconforming work

Findings from management reviews and the actions that arise from them shall be recorded. The management shall ensure that those actions are carried out within an appropriate and agreed timescale. The laboratory shall have a procedure for review by management and maintain records of review findings and actions. The QA office is responsible for scheduling reviews as needed and maintenance of all records.

PERMITTED DEPARTURES FROM DOCUMENTED POLICIES AND PROCEDURES

Any departures from documented policies and procedures or changes in standard methods must be approved by a Laboratory Director or the QA Manager. The deviation from standard methodology must be explained on the final report and the results flagged to indicate the use of a non-standard method. The * flag or qualifier is used to note non-standard methodology and the explanation is noted in the comments section of the Lab Report.

CONTROL OF NONCONFORMING ENVIRONMENTAL TESTING WORK

When any aspect of its environmental testing work, or the results of this work, do not conform to its own procedures or the agreed requirements of the client, the QA manager shall be informed and the actions below shall be taken:

a): As necessary, the work shall be halted and the test reports shall be withhold;
b): An evaluation of the significance of the nonconforming work is made by the QA Manager and the Technical Director;
c): Corrective actions are taken immediately, together with any decision about the acceptability of the nonconforming work;
d): Where the data quality is or may be impacted, the client is notified.
e): The NCD form may be used to record actions. Any required changes resulting from corrective action investigations shall be implemented and documented.
f): The QA manager is responsible for authorizing the resumption of work.
g): As necessary, the investigation results, corrective actions and follow-ups for the non conforming work shall be reviewed by the Laboratory Management immediately.

PREVENTIVE ACTIONS

Preventive action is a process to identify opportunities for improvement rather than a reaction to the identification of problems or complaints. Needed improvements and potential sources of nonconformance, either technical or concerning the quality system, are identified. If preventive action is required, action plans are developed, implemented and monitored to reduce the likelihood of the occurrence of such non- conformances and to take advantage of the opportunities for improvement. Procedures for preventive actions include the initiation of such actions and application of controls to ensure that they are effective.

EQUIPMENT MAINTENANCE

Written records are kept for each analytical instrument to document inspections, maintenance, troubleshooting, or modifications. Records contain the date, nature of the problem, repair/corrective action taken and the name of the person performing the work. A Maintenance Log Book may be kept for each individual instrument for the purpose of recording any maintenance, repairs, and other associated downtime.

Operational performance of analytical instrumentation is monitored by daily, documented performance checks and calibration verifications in accordance with the Standard Operating Procedures for each type of instrumentation.

Support equipment such as analytical balances, ovens, refrigerators and water baths are checked daily for performance within acceptance limits. This information is recorded in a log book maintained for the equipment. Weights used to check the balances are traceable to NIST standards. In addition all balances are inspected and certified by a licensed specialist at least annually.

REFERENCES:

NELAC Quality Systems, *effective July 1,2003.*

NELAC Quality Systems Checklist, Revision Ch5 Rev *d.*

QUALITY ASSURANCE MANUAL REVISION HISTORY

Revision 09/2004: QA Manual all sections re-written to incorporate NELAC guidelines.
Added sections for:
- Demonstration of Capability
- Review of New Projects
- Protection of Client Confidentiality
- Calibration and Verification Procedures

Updated Appendix A, Laboratory Job Descriptions
Updated Appendix B, Standard Operation Procedures for Sample Receiving
Updated Appendix D, Equipment Inventory

Revision 05/2005: QA Manual re-written to incorporate more NELAC requirements.
Added Appendix G, Organization Chart
Added Appendix H, Listing of CA Accredited Methods
Added references to SOPs for Document Control

Revision 10/2005: Sections added in response to NELAC Audit.
Added section for personnel qualifications, pg. 8.
Added training program requirements, pg. 8.
Rewrote Demonstration of Capability, pg.10.
Rewrote procedures for reporting analytical results, pgs. 19-21.
Added section for ensuring the validity of environmental tests, pg.22.
Added section for essential Quality Control Procedures, pg. 24.
Edited section for Internal Audits, pg. 25.
Added section for management review, pg. 27.
Rewrote sample handling practices and chain of custody, pg. 13.

Revision 7/2008: Sections added or re-written in response to NELAC Audit:
Added current ELAP and NELAP certificate test lists.
Added to the section for Handling Customer Complaints, pg. 22.
Added to the section for Corrective Action Reports, pg. 26.
Added to the section for Management Review, pg. 27.
Added Section for Control of Nonconforming Testing Work, pg. 28.

Revision 7/2009:	Added Hongling Cao, Manager of Quality Assurance to signature page to replace James McCall. Added provision for "instant read" thermometer, pg. 35, B.2.e. Updated Inventory List, Organization Chart, Sample Acceptance Checklist and Sample Containers and Preservation Guide.
Revision 7/2010:	Updated the Equipment Inventory, Organization Chart and FOT.

APPENDIX A

LABORATORY JOB DESCRIPTIONS

Technical Director (Lab Director)

Education: Bachelors degree or equivalent in the chemical, environmental, biological sciences, physical sciences or engineering, with at least 24 college semester credit hours in chemistry.

Experience: At least two years of experience in the environmental analysis of representative inorganic and organic analytes for which the laboratory seeks or maintains accreditation. A masters or doctoral degree in one of the above disciplines may be substituted for one year of experience

Job Description: The technical director(s) means a full-time member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations for the appropriate fields of accreditation and reporting of results. This person's duties shall include, but not be limited to, monitoring standards of performance in quality control and quality assurance; monitoring the validity of the analyses performed and data generated in the laboratory to assure reliable data.

Responsibilities: Overall responsibility for management of all laboratory operations.

Quality Assurance Manager

Education: Bachelor's degree in chemistry or other scientific/engineering discipline or equivalent experience.

Experience: Three or more years experience in a chemistry laboratory.

Job description: The quality manager (and/or his/her designees) shall:

1. Serve as the focal point for QA/QC and be responsible for the oversight and/or review of quality control data;

2. Have functions independent from laboratory operations for which they have quality assurance oversight;

3. Be able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence;

4. Have documented training and/or experience in QA/QC procedures and be knowledgeable in the quality system as defined under NELAC;

5. Have a general knowledge of the analytical test methods for which data review is performed;

6. Arrange for or conduct internal audits as per 5.4.13 annually; and,

7. Notify laboratory management of deficiencies in the quality system and monitor corrective action.

Responsibilities: Overall development and management of the laboratory quality assurance system as defined by California Dept of Health / ELAP and NELAP requirements.

Laboratory Supervisor

Education: Bachelor's degree in chemistry or other scientific/engineering discipline or equivalent experience.

Experience: Three or more years experience in a chemistry laboratory.

Job Description: Responsible for the overall technical and personnel management of a laboratory area or work group. This includes:

1. Interfacing with and taking direction from the Department Head or immediate supervisor.

2. Proper training of personnel in analytical techniques, reporting, quality, assurance and lab safety.

3. Maintaining the orderly flow of work and the timely analyses of samples.

4. Organizing and assigning work duties of the group supervised.

5. Checking QA/QC records for completeness and proper frequency.

6. Providing for technical expertise as required in the group or department.

7. Evaluating and working to constantly improve the quality of data that is being generated (including QA data)

Responsibility, Supervisors are ultimately responsible for:

1. The accuracy, completeness and integrity of all analyses completed by their group or department.

2. Safe practices of their employees.

3. Maintaining effective communication with their employees and upper management of the laboratory.

4. Complete documentation of all analyses and related QA/QC.

5. Any deviation from standard methods or laboratory standard operating procedures.

Analyst

Education: Requires minimum of Bachelor's degree in chemistry or any scientific/engineering discipline or equivalent experience.

Experience: Once or more years experience in a chemistry laboratory operating and maintaining analytical instrumentation such as AA, ICP, GC, HPLC, etc.

Job Description: Conducts analyses in laboratory using specialized analytical equipment. Analyses are done using standard protocols such as EPA, EPA/CLP, or in-house SOP's). Must understand the theory, use and maintenance of specialized analytical equipment. Must be able to follow written procedures and SOP's and calculate final results, including QA results. Must understand the importance of good lab practices and quality assurance and be able to evaluate the quality of data that is being generated.

Responsibility: Analysts are responsible for the accuracy, completeness and integrity of all work that they have been assigned. If they have questions or problems, this must be communicated to their immediate supervisor. No deviations from standard methods are permitted unless approved by the lab supervisor.

Lab Technician

Education: Requires high school diploma with one year of chemistry course work or one year of Chemistry course work or one year experience in a laboratory.

Experience: One or more years experience in a laboratory (preferably a chemistry lab). Must have proficiency in operation of analytical balance, pipetting and common laboratory equipment and glassware.

Job Description: Conducts analyses in laboratory using standard methods (EPA, AOAC, USP, ASTM, or in-house methods). Must understand lab nomenclature and be proficient in the use of standard lab equipment such as pipets , balances, separatory funnels burets, etc. Must be able to follow written procedures and SOP's and calculate final results. Must understand the importance of good lab practices and quality assurance.

Responsibility: Lab Technicians are responsible for the accuracy, completeness and integrity of all work that they have been assigned. If they have questions or problems, this must be communicated to their immediate supervisor. No deviations from standard methods are permitted unless approved by the lab supervisor.

APPENDIX B

STANDARD OPERATING PROCEDURE FOR SAMPLE RECEIVING

TABLE OF CONTENTS

I. INITIAL RECEIPT OF SAMPLES

This section describes how samples are received and logged into the laboratory. "Logging" refers to the process of documenting receipt of each sample, verification of the analyses requested and entry of information about the sample into the laboratory computer system (LIMS). The sample logging process generates one label for each sample container, a Lab Request Summary on blue paper and a blue Results Worksheet for each department. A copy of the Lab Request Summary and the blue Results Worksheet is transferred to each department which will be analyzing the sample. No sample is analyzed without being properly logged into the laboratory data system, even if the sample is not to be billed.

A. Handling of Samples Received by Client Delivery:

When a client delivers a sample for analysis, it is important that information about the sample be as complete as possible. This is best done with a properly completed and signed Chain of Custody form. The following information must be obtained before the sample can be accepted:

1. Client's name and address

2. Person to contact regarding the sample(s) and phone number (also fax number if information is to be faxed).

3. Method of payment, does client have an account? If client does not have an account, payment will have to be in advance or "pickup and pay". If the client has an account, a purchase order number is often needed.

4. If the Client wishes to open an account, the accounting department should be notified to be sure the client receives the proper forms and information, this is currently handled by Bill Utter.

5. Before entering a new client into the computer system a unique account code number must be obtained from the accounting department or office supervisor.

6. Both the client and lab employee receiving the sample must both sign the completed Chain of Custody form. The Chain of Custody will normally contain detailed information on the samples. Refer to Section II for a list of required information to be included on this form.

7. The client receives the pink copy of the Chain of Custody. The other copies are attached to the Lab Request Summary.

8. Samples must be checked for temperature and sample preservation as noted in B.2. and B.6 below.

B. Sample pick-up by our personnel:

1. All samples received from our drivers should be accompanied by a completed Chain-of-Custody form - signed by the client and by the driver.

2. All coolers received must have a temperature reading immediately upon opening.

a. This reading will be taken by placing the metal probe of the thermometer either into a temperature blank (if provided) or between the respective samples and the cooling media (ice, dry ice, or blue ice).

b. The thermometer should remain in place for 60 seconds to ensure a proper reading.

c. The exact temperature will then be read from the thermometer. The temperature should be in the range of 2 - 6 degrees C. Samples that are hand delivered to the laboratory immediately after collection are considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice.

d. The temperature will be noted on the Sample Receipt Form.

e. The temperature may also be determined using an "instant read" thermometer which reads the surface temperature of the samples in the cooler.

3. The Chain of Custody and samples must be checked to make sure that all information is in agreement.

4. When the driver relinquishes the samples to the Sample Receiving Department, he or she must require that the Associated Laboratories Chain of custody be signed by an employee of the Sample Receiving Department. A sample receipt form must be filled out for all coolers received by the Department.

5. All samples brought to the laboratory by a driver will remain under his or her custody until the Associated Laboratories Chain of custody is signed by an employee of the Sample Receiving Department.

6. If necessary, the pH of aqueous samples may be measured at the Sample Receiving Department. The result shall be reported on a pH reporting form. This form is attached to the Chain of Custody. To avoid contamination of the sample, a portion of the sample is poured into a separate container for pH determination or directly onto the pH paper. The procedure for checking pH is detailed in the SOP for pH Measurement.

7. Any problems with improper preservation, sample container type, volumes, etc. are to be noted on the Sample Receipt Form. This is to document problems which may interfere with a proper analysis of the sample. The project manager should be notified so that the client can be contacted as soon as possible.

8. Information on the sample pickup is also logged into the bound Driver's Logbook.

9. All organic volatile samples (VOA) must be stored in the Sample Receiving refrigerator until they are labeled.

10. All information is checked to be sure it is complete as noted in Section A.1-6 (Client's name/ address/ contact name/ phone number/ account information/ PO number/ complete sample information/ analyses requested).

11. All samples are checked to be sure they match the paperwork.

12. The client must be contacted if the information is not complete or if there are any questions about the samples, analyses requested, or if samples are received broken or missing.

C. Samples received by mail, UPS, Federal Express, etc.

Samples received by mail, UPS and Federal Express are handled in the same manner as samples received from our drivers with the exception that samples are not relinquished by the client. All coolers received must have a temperature reading as in section B.2. and all samples must be verified against the Chain of Custody or paperwork as noted above. *The sample shipping receipts shall be attached to the original Lab Sheet.*

D. In-house samples

In-house samples consist of samples such as QA/QC check samples and hazardous waste disposal samples. These samples are written up using the same procedures as any other sample. (They will not normally be billed.)

E. Priority samples

1. Samples are logged in the following priority:

   a. Bacteriology

   b. Rushes (Same Day, 24 Hour, 48 Hour)

   c. Tests such as BOD, Chlorine, pH, Dissolved Oxygen, Sulfite, Sulfide, Hexavalent Chromium, fish toxicity, nitrate, nitrite, MBAS, turbidity must be logged the same day as received due to the very short holding times.

   d. Regular Turn-Around

2. NOTE: It is important that this priority be followed for all customers to insure that accurate results are obtained for samples which have a very short holding time.

3. Regular turn-around samples are written up in the order received and may be held to the next day if necessary.

4. When a client requests a completion date, or we commit to a completion date, this information must be clearly stated (and highlighted) on the lab request summary.

Note: the affected lab manager must be consulted prior to committing to a completion date.

5. If a client wishes samples to be handled on a priority basis, such as 24 or 48 hours, there is an additional charge. The priority charge is determined by lab management, and should be clearly stated to the client.

6. Priority samples are written up and labeled before being transferred to the laboratory. These samples are recorded in the Sample Rush Log Book and the lab personnel receiving the samples must sign for all priority samples (which include a copy of the chain of custody).

F. Special Handling of Samples for Microbiological Testing

1. Due to the short holding times for microbiological samples, these must be handled on a first- priority basis.

2. The Chain-of-Custody for samples for microbiological testing must state the date and time of sampling, as well as complete sample identification. For potable water samples this should also include the system name and sample location.

3. Drinking water samples (potable water) should be analyzed as soon as possible after sampling (30 hours maximum time from sampling to analysis). Samples must be maintained at 2 - 6 degrees C during transport and storage. Potable water samples cannot be analyzed after 30 hours, these samples should be refused.

4. Waste water and surface water samples must be analyzed within 6 hours after collection (6 hours maximum holding time). Samples must be maintained at 2 - 6 degrees C during transport and storage. Water/ waste water samples older than six hours should be refused.

5. Upon receipt in Sample Receiving, check samples immediately for proper temperature and holding time. Samples should be transported in a cooler with blue ice or regular ice. Check Chain-of-Custody form to be sure samples are within holding times. If samples are outside holding time or not held at proper temperature, notify the Microbiology Department supervisor or project manager immediately. The Chain-of-Custody shall also state the conditions of the samples as received (cooled, frozen, room temp. etc.).

6. Check condition of samples received for microbiological testing for potential contamination of samples. Containers must be sealed with no evidence of leakage. Containers must be protected from melted ice or other potential contamination. Notify the Microbiology supervisor if problems are noted. If there is evidence of contamination the client should be notified that the samples are potentially contaminated.

7. Samples should be refrigerated or placed in a cooler with blue ice upon receipt and logged in immediately. The Microbiology Department will sign the original chain of custody to show receipt of samples prior to logging.

G. Sample storage during login process

1. When possible samples are written up as soon as received.

    3. A designated sample storage refrigerator is used for storage of samples which need to be refrigerated during the login process (samples for volatile organics analysis are stored in a separate refrigerator).

3. As soon as possible after each group of samples is logged in, they are transferred to the Sample Custodian in the Sample Storage Area. Most samples are stored in refrigerators or the walk-in cooler until analyses are completed. The sample storage refrigerators and the walk-in cooler are kept locked overnight for sample security.

4. If special handling instructions are provided with the sample, these instructions must be noted on the Chain of Custody and sample login analysis request forms.

H. **Hold samples**

1. When a client wishes to put samples on hold, this must be clearly noted on a Chain-of-Custody form. The length of time requested for hold should be noted.

2. If the hold order is given over the phone, a note is made on the COC referring to the person authorizing the hold, with complete information on the samples to be held. The person taking the call should sign and date the note. Any changes to the Chain of Custody by the client should be followed by a fax from the client detailing the changes in writing.

3. Complete information on hold samples are filed with the Chain-of-Custody and given with the samples to the Sample Custodian for storage until the Client or project manager releases the samples from hold status. If hold samples are disposed of, they are logged out by the Sample Custodian.

4. After 7 days, if the client has not contacted us regarding the samples, sample receiving personnel or the project manager should call the client for instructions.

5. Maximum holding time is 30 days unless special arrangements are made and authorized by the lab management.

6. Unless authorized by the customer, disposal of hold samples must be authorized by the Lab Manager.

I. **Safety Precautions**:

1. The lab does not accept radioactive samples for analysis. A Radiation Monitor is available in the Sample Receiving Department for screening samples if radiation is suspected in any sample.

    a. Any samples received from Department of Energy (DOE) contracts or associated clients must be screened to insure that no radioactivity is present.

b. If any sample tests higher than background 25 cpm level radiation, the Radiation Safety Officer must be notified immediately.

2. All sample shipments received from hazardous waste sites or labeled as highly toxic must be initially opened in a fume hood or in a well-ventilated area.

3. Plastic gloves are available in the Sample Receiving Area for handling potentially hazardous samples or samples which are leaking.

4. When in doubt about the safe handling of any sample, the Lab Safety Officer or appropriate Lab Manager must be consulted before the sample is logged in.

II. **CHAIN OF CUSTODY FORM**

A. The purpose of the Chain of Custody Form is to legally document the transfer of the sample(s)from the customer to the laboratory. Since any sample may potentially be used as evidence in legal proceedings, it is important that the Chain of Custody Form be filled in completely and accurately.

B. The Chain of Custody Form should furnish an accurate record of the samples received, analyses requested, and any important information from the Client regarding the samples. The information entered on the form should be as complete as possible, including:

1. Client's name and address with zip code

2. Client project manager's name and telephone number

3. Information on custody seals - If present are they intact?

4. Information on Samples:

    a. Is the number of samples listed correctly?

    b. Are all samples individual, or sub-samples of one sample?

    c. Is the description of the samples complete?
    (are samples soil, waste-water, drinking water (if samples are chemicals, a complete description and MSDS information should be furnished.)

    d. Are samples identified correctly? Sample ID numbers or markings should be checked against the Chain of Custody. The date sampled should also be on the chain of custody.

    e. The condition of the samples should be noted.
    - Are samples cool or frozen?
    - Are containers leaking or broken?
    - Damaged containers should be noted on the Sample receipt form under "important information section" and reported to the project manager immediately.

f. The type of containers must be noted (glass jar, plastic container, brass tube, VOA vial, etc.)

g. All preservatives added to the samples must be noted on the sample containers and is indicated on the sample pH log form attached to the chain-of-custody.

h. Any inconsistencies in the documentation and samples should be thoroughly investigated. The ideal time to solve a problem is during the log-in process.

5. Analyses requested by the Client must be specific and correspond EXACTLY to our listed analyses profile. If there is any doubt as to the analyses required, the Sample Receiving Person should contact the Client, or the appropriate Lab Manager.

- In the case where subsamples of the same sample are submitted, and different analyses are requested for each sub-sample, all information and the labeling of each container must be made VERY CLEAR to avoid confusion in the laboratories. EACH CONTAINER MUST HAVE A LAB REQUEST NUMBER and an ORDER NUMBER.

6. Any problems with improper preservation, sample container type, volumes, etc. are to be noted on the Chain of Custody. This is to document problems which may interfere with a proper analysis of the sample. A written copy should also be given to the Lab Project Manager or Customer Representative who may need to contact the customer.

7. The Client should sign in the " Relinquished by " space and also in the " Authorization " space when appropriate.

8. The person receiving the sample(s) must sign the Chain of Custody Form in the "Received by Laboratory for Analysis" space, and record the date and time.

9. When the sample is entered into the Laboratory computer system (a Lab Request Summary is generated) the Lab Request Number should be recorded on the Chain of Custody.

10. Distribution of copies:

a. Attach the White and Yellow Copy to the Blue Lab Request Summary.

b. The Pink Copy is given to the Client.

c. A copy of the Chain of Custody should be attached to all copies of the Lab Request Summary.

d. All Lab Requests are checked by the appropriate Project Manager.

III. **SAMPLE CONTROL RECORD** (Internal Chain of Custody)

A. A separate Sample Control Record for sample tracking through the laboratory may be initiated by the Sample Receiving Department if this is required by a client or contract (such as EPA/CLP).

B. Information to be entered into the Sample Control Record (refer to the attached copy):

1. The Lab Request Number is written at the top of the Form.

2. The Client's Name and Date is recorded.

3. All individual samples are recorded in the Sample ID space. Samples are identified by the Lab Request Number assigned at the time of sample Log-In. This number is generated by the computer when the sample(s) are logged-in to the computer system.

C. Storage of samples requiring Sample Control Record (Legal Samples).

1. After the samples are logged into the computer system and labeled, they are transferred to a locked storage refrigerator in the Sample Storage Area.

2. Document the transfer of all samples to and from the Sample Custodian with the date and time samples were transferred. Both the Sample Receiving person and Sample Custodian sign the Sample Control Record.

3. For Legal Samples (including EPA/CLP samples), the samples must be kept in locked storage. In this case the Sample Control Record is kept by the designated Sample Custodian who also controls access to the samples. When samples are removed from storage they are logged out on the Sample Control Record which records the date, time and person removing the samples. When the samples are returned they are logged back in with the date, time and initials of the person returning the samples. Samples are not removed from locked storage overnight. The person who removes the samples is responsible for the custody of the samples, and for their return to storage before the end of the working day.

D. Sample Control Record Tracking

1. Each time samples are transferred to or from the Sample Custodian, the Sample Control Record for those samples must be signed.

2. Each person receiving the samples in each department must sign for those samples received and also note the date and time samples are received. Fill in Received By - Dept., Person and Date/Time when samples are delivered to each department and again when the samples are returned to the Sample Custodian.

3. Only one sample control record will be completed for each lab request number (Sample Log In Sheet). No copies are to be made unless clearly labeled as a copy.

4. The Sample Control Record is kept on file by the Sample Custodian and attached to the file when all analyses are completed.

IV. **SAMPLE ACCEPTANCE POLICY**

Sample acceptance policy determines if the sample is identified correctly, with proper documentation, packaging, adequate volume for the analyses requested and correct preservatives.

1. Sample identification (is the sample waste water, drinking water, hazardous waste, unknown?). For accurate analysis, the sample and sample source must be identified correctly. If there is an obvious discrepancy between the sample and documentation, this is normally investigated first by the Sample Receiving Personnel. If the problem cannot be resolved, then the appropriate lab manager is notified.

2. Documentation with the sample (is it adequate?). Sufficient documentation should be supplied with the sample to fill in the Chain of Custody completely. If there are any doubts as to the sample identification or analyses requested, the client should be called immediately.

3. Documentation generated during sample login. All communications *via fax, email or mail* and decisions regarding the client samples should be documented and signed in writing and attached to the original Lab Sheet (and all copies if necessary).

4. Sample condition (sufficient volume, correct preservative, correct container type, condition of sample, etc). The employee receiving the sample must note on the Chain-of-Custody form or an attached Sample Receipt Form the following information for each sample and fraction:

    a. Container Type (Glass, Amber glass, plastic, brass tube, etc.).

    b. Volume in container (1 L, 500 ml, etc.)

    c. Temperature (Room temp., cool, frozen)

    d. If samples are in a cooler, the temperature in the cooler.

    e. Preservatives added must be listed on the sample container and/or the Chain of Custody form.

    f. The sample must be within the specified holding times for the analyses requested.

    g. Any irregularities noted in the samples (leaking, air bubble in VOA vial, improper packaging, etc.).

5. Responsibility for contacting the customer about problems. The Sample Receiving personnel have primary responsibility for contacting the project manager or client immediately for routine problems with samples. Each client is normally assigned to a project manager, and the person logging the sample is also responsible for informing the project manager of any problems. This may be done with notes on a copy of the

lab sheet or chain of custody. Generally all information and decisions must be documented in writing with a date and signature.

6. *A sample receiving checklist must be completed and attached to the final report. See Appendix I for Sample Receiving Checklist.*

V. SAMPLE LOGGING PROCEDURES

A. Description of Computer Logging Procedure:

1. The LIMS system will be used to record and track all samples received at the laboratory. Completed test results should be turned in to the project manager as designated on the Lab Request Summary.

2. Each Department should report the results of all analyses on the blue Results Worksheet and turn this in to the project manager, along with all worksheets and raw data generated in analyzing the samples.

3. When samples are logged into the LIMS system, the system will create one label for each sample container, a Lab Request Summary on blue paper, and a Results Worksheet for each lab department on blue paper. When samples are logged into the LIMS, they are assigned a unique sample number (order number) and all samples in the same group, received on the same day are normally assigned to a unique Lab Request Number.

4. The Sample Receiving personnel will make copies of the login documents as follows: A copy of the Lab Request Summary and the chain-of-custody for each Results Worksheet.

5. Copies of the login documents will be distributed as follows:

    a. Project Manager: The Lab Request Summary and one copy of the Chain of Custody.

    b. Each Department: The blue (original) Results Worksheet + copy of the Lab Request Summary + copy of the Chain of Custody.

    c. Attach the original Chain of Custody to the original Lab Request Summary.

    d. A Posting Log Book is maintained to verify that a copy of the Lab Request and Worksheets was distributed to each affected Department.

6. If problems are noticed with the test codes, analyte list or detection limits (DLR) please correct the Worksheet and give a copy to Jim or Steve as soon as possible so

corrections can be made in the LIMS.

B. **Description of Lab Request Summary**

1. A Lab Request Summary is prepared which includes:

a. Client name, address and client ID number.

b. Person to whom final report is to be sent.

c. Date sample received.

d. A complete description of the sample(s) including client identification number(s), sample matrix, date /time sampled.

e. A Lab Request Number and an order Number is generated by the computer for each sample.

f. A complete list of all analyses to be completed on each sample, including Method Number, Profile and Service Group / Department.

g. Login information including ID of person logging in the sample, date and time.

h. Order numbers and corresponding customer ID numbers for each sample.

i.A Sample Control Record (Internal Chain of Custody) is completed if needed. This document is used to record the transfer of the samples to departments (see section III).

See Appendix J for a sample of Lab Request Summary.

C. Sample Labeling

Each sample is labeled with the label generated by the computer. The label contains the Lab Request Number, Order Number, Client sample ID and log date.

For Orders where multiple containers are submitted (multiple fractions for different analyses), each separate container (fraction) should be labeled with the order number + A , B , C , etc. to designate fractions for each separate analysis. This fraction designation is then recorded by the custodian and analyst on the sample preparation log to document that the correct sample fraction was analyzed for each analysis method.

D. Procedure for Logging in Additional Analyses.

1. If additional analyses are requested by a client after the samples have been initially logged in and distributed to the labs, an amended Lab Request Summary may be

generated for the additional analyses (using the same Lab Request number). The amended Lab Request Summary will note the additional tests in the Comments section.

2. Additional analyses may also be noted using an additional analyses request form to notify all affected departments of the additional tests. Information required is as follows:

a. Name of client
b. Previous Lab ID#
c. Sample type
d. Sample ID
e. Additional analyses
f. Date of request
g. Signature of employee

3. A new Lab Request will be generated if necessary. The new Lab Request Summary will have a new Lab Request Number for the additional analyses, and the samples will be relabeled with the new Lab Request Number. The original Lab Request Number will be retained on the samples.

a. The new Lab Request Summary must clearly reference the original Lab Request number and explain that analyses requested are in addition to the previous analyses (or other reasons for the new Lab Request Summary).

b. Copies of the new Lab Requests are forwarded to all departments affected.

E. **Backup Logging Procedure in Event of Computer System Failure**.

1. Temporary lab Request Summaries have been designed and are available in the Sample Receiving Department.

2. In the event the computer system is non-functional, the Sample Receiving Supervisor will issue temporary lab Request Summaries along with a temporary login reference number (eg. A100).

3. The supervisor will keep a list of assigned numbers and corresponding information (client, departments receiving lab Request Summaries, person writing the ticket).

4. When the computer is functional, standard lab Request Summaries will be issued.Samples that have received temporary numbers will be retrieved and re-numbered with the computer assigned lab Request Numbers. The standard lab Request Summaries will be attached to each corresponding temporary lab Request Summary that was issued.

VI. HANDLING OF THE SAMPLES AFTER LOGGING

A. Handling of the logged-in samples in the laboratory

1. After the samples are logged into the computer system and labeled, they are transferred to the Sample Custodian in the Sample Storage Area. All samples are logged into the Sample Control Log Book organized by Lab Request number. The client name, number and type of containers are entered. The Sample Custodian must sign the Log Book for all containers received.

2. The samples are stored in locked refrigerators or the locked walk-in cooler prior to analysis.

3. All samples transferred to the Sample Storage Area are logged into a Sample Logbook in the Sample Storage Area. The Sample Logbook is maintained by the Sample Custodian.

4. When samples are picked up by laboratory personnel for analyses, the samples are signed out, and when returned, they are signed back into Sample Storage.

5. When samples are disposed of, this is noted in the Sample Logbook.

6. During weekends and evenings, only designated personnel have access to the Sample storage areas. All samples removed must be documented in the Sample Custodian Logbook.

B. Handling of samples to be sent out to other labs.

1. Arrangements to send samples out for analysis are handled by the project manager and must have the Client's consent.

2. Samples to be transferred to another lab are logged into the LIMS for "Send Out" and the Information is posted on the "Out Board" similar to posting to an in-house department. Samples to be sent out are subsampled and shipped by the Sample Custodian.

2. A portion of each sample to be sent out is retained in the original container. Procedures for sending out samples to other labs is described in the SOP for Subcontracting Analyses and the SOP for Soil Sub-Sampling and Compositing Procedures.

C. Returning samples to the client.

1. When a client requests that the samples be returned to them upon completion of the analyses, the sample receiving personnel should make sure that a notification is made on the lab sheet and that it is clearly visible

2. When all analyses are completed, a note is given to the Sample Custodian listing the samples to be returned and address to be used.

3. If the sample is returned by UPS, the sample pickup record will document that the sample was returned. If the sample is delivered by our driver or picked up by the client, the client should sign the chain of custody or a receipt to show the samples were returned to them.

A record book is maintained in Sample Receiving to document the return of samples.

APPENDIX C

Sample Container and Preservation Guide

Updated: April 17, 2009

	Method	Container[1]	Suggested Volume	Preservative	Holding Time[2]
Volatile Organics					
(VPH) Gasoline	(5030) 8015 B	VOA-glass	2 40ml vials	Cool 6 C	7 days[3]/14 soil(6)/3day air
(VPH) Gasoline/BTEX	(5030) 8015B/8021B	VOA-glass	2 40ml vials	Cool 6 C	7 days[3]/14 soil (6)/3day air
Purgeables	624/8260B	VOA-glass	2 40ml vials	Cool 6 C	14 days/3day air
Purgeables in DW	524.2	VOA-glass	2 40ml vials	Cool 6 C, Ascorbic Acid + HCl	14 days/3day air
Semi-Volatile Organics					
(EPH) Diesel(Carbon Chair	8015B	glass-amber	1 L	Cool 6 C	7 days/14 soil[4]
Semi-Volatiles (BNAs)	625/8270	glass-amber	1 L	Cool 6 C	7 days/14 soil[4]
Pesticides & PCBs	608/8081	glass-amber	1 L	Cool 6 C	7 days/14 soil[4]
Phosphorous Pests.	614, 622/8141	glass-amber	1 L	Cool 6 C	7 days/7 soil[4]
Herbicides	615/8151	glass-amber	1 L	Cool 6 C	7 days/14 soil[4]
Polynuclear Aromatics	610, 8310	glass-amber	1 L	Cool 6 C	7 days/14 soil[4]
Haloacetic Acids	552.2	glass-amber	250 ml	Cool 6 C, 5mg NH_4Cl/50ml	14 days[4]
Carbamate Pesticides	632	glass-amber	1 L	Cool 6 C	7 days[4]
EDB/DBCP	504	glass	2 40ml vials	Cool 6 C, Na2S2O3	14days
Metals					
Mercury	245.1/7470	poly	500 ml	HNO_3 to pH<2	28 days
Chromium VI	218.6/SM3500 Cr-D	poly	500 ml	Cool 6 C/filter, NH4/SO4 to pH9.3-9.7	28days
	7199/7196	poly	500 ml	Cool 6 C	24 hours
Organic Lead	DHS (LUFT)	glass-amber	1 L	Cool 6 C	14 days
All Other Metals	200/6000/7000	poly	500 ml	HNO_3 to pH<2	6 months

Inorganic & Wet Chemistry

Alkalinity	310.1/SM2320B	poly or glass	500 ml	Cool 6 C	14 days
COD	410.4/SM5220C/SM5220D	poly or glass	500 ml	Cool 6 C, H_2SO_4 to pH<2	28 days
BOD	405.1/SM5210B	poly or glass	1L	Cool 6 C	48 hours
Chloride	300	poly or glass	500 ml	None	28 days
Cyanide	335.1/335.2/9010B/4500CN	poly or glass	1 L	Cool 6 C, NaOH to pH>12[5]	14 days
Cyanide	335.4/9012A				
Flashpoint	1010/1030	poly or glass	500 ml	None	N/A
Fluoride	300.0/340.2/SM4110B/SM 4500-FC	poly or glass	500 ml	None	28 days
Hardness	200.7/SM2340B/SM3120B	poly or glass	500 ml	HNO_3 or H_2SO_4 to pH<2	6 months
Nitrate, Nitrite	353.2/SM4500-NO3F/300.0/SM4110B	poly or glass	500 ml	Cool 6 C	48 hours
Total Nitrate/Nitrite-N	353.2/SM4500-NO3F/300.0/SM4110B	poly or glass	500 ml	Cool 6 C, H_2SO_4 to pH<2	28days
Oil & Grease	1664A/SM5520B	glass-amber	1 L	Cool 6 C, H_2SO_4 to pH<2	28 days
Phenols	420.1	glass-amber	1 L	Cool 6 C, H_2SO_4 to pH<2	28 days
Phosphorous (Total)	365.2/SM 4500-PE	poly or glass	500 ml	Cool 6 C, H_2SO_4 to pH<2	28 days
Phosphate (Ortho)	365.2/SM 4500-PE	poly or glass	500 ml	Cool 6 C	48 hours
pH	150.1/SM4500-HB/9040B/9045C	poly or glass	500 ml	None	Immediate
Turbidity	EPA 180.1	poly or glass	100ml	Cool 6 C	48 hours
Solids (TDS, TSS, TS)	160.1/160.2/160.3/SM2540C	poly or glass	500 ml	Cool 6 C	7 days
Specific Conductance	120.1/SM2510B	poly or glass	500 ml	Cool 6 C	28 days
Total Sulfide	376.2/SM4500-SDF/9034	poly or glass	500 ml	Cool 6 C, $ZnCO_2CH_3$+NaOH pH>9	7 days
Soluble Sulfide	376.2/SM4500-SDF/9034	poly or glass	500 ml	Cool 6C	Immediate
TRPH	418.1	glass-amber	1 L	Cool 6 C, H_2SO_4 to pH<2	28 days
TOC	415.1/SM5310B	glass-amber	250 ml	HCL to pH<2	7 days
TOX	9020	glass-amber	500 ml	HNO_3 to pH<2	28 days
Ammonia	350.2/SM4500-NH3C,G	poly or glass	500 ml	Cool 6 C, H_2SO_4 to pH<2	28 days
TKN	351.2	poly or glass	500 ml	Cool 6 C, H_2SO_4 to pH<2	28 days
Chlorite	300	poly or glass	500 ml	Cool 6 C, EDA	48 hours

Radioactivity	9000	Any	1 L	HNO_3 to pH<2	7 days
Bioassay (Effluent)	600/4-85/01	poly or glass	5 Gallons	Cool 6 C	36hr
MBAS	EPA425.1/SM5540C	poly or glass	250ml	Cool 6 C	48hours
Disolved CO2 in Water	SM4500-CO2	poly or glass	250ml	Cool 6 C	Immediate

Notes:

(1) Soil samples are typically collected in brass or steel tubes and wide mouth jars (500ml)

(2) Unless otherwise stated, holding times apply to soil and water matrices.

(3) To extend the holding time to 14 days, prepare bottle with HCL to pH<2

(4) Holding times shown are days until extraction. Samples have a 40-day (7-day for 552.2) holding time after extraction.

(5) If chlorinated, add 0.6g Ascorbic Acid

(6)If soil samples are in EnCore, the holding time is 48hours. Freezing the unpreserved sample can extend the holding time up to seven days.□

APPENDIX D

Capital Equipment Inventory

Last Update: June 2009

Department	Instrument Description	Quantity	Serial No.	Date
Chemistry	Perkin Elmer FIMS400 Flow Injection Mercury Analyzer with AS90 Autosampler and Data System	1	4543/3670	
Chemistry	Lachat FIA+ Quickchem 8000 Flow Injection Analyzer with Autosampler and Data System	1	A83000-1315	
Chemistry	Lachat Colorimeter (10mm path)	1		
Chemistry	Lachat Manifold (NO2/NO3)	1	10_107_04_O	
Chemistry	Lachat Manifold (NH3-N)	1	10_107_06_1-A	
Chemistry	Lachat Manifold (TKN)	1	10_107_06_2-E	
Chemistry	Lachat Manifold (CN)	1	10_204_00_1-A	
Chemistry	Lachat Manifold (TKP)	1	10_115_01_1-P	
Chemistry	Dionex 2000 Ion Chromatograph with Autosampler, ASRS Supressor, CD20 Conductivity Detector and data system – System I	1	96030596	
Chemistry	Dionex 2000 Ion Chromatograph with Autosampler, ASRS Supressor, ED40 Electrochemical Detector and data system – System I	1	97020907D991001	
Chemistry	Dionex 2000 Ion Chromatograph with Autosampler, ASRS Supressor, CD25 Conductivity Detector and data system (perchlorate analysis) – System II	1	01090605	

Chemistry	Dionex 2000 Ion Chromatograph with Autosampler, AD25 Absorbance Detector and data system (hexavalent chromium analysis) – System I1	1	01120109	
Chemistry	Dionex 3000 Ion Chromatography with AS Autosampler, Dual Pump, EG 11 KOH cartridge, EG, CR-ATC Continuously Regenerated Anion Trap Column and CD conductivity Detector	1	08110325 08110200	
Chemistry	Tekmar Dohrman DX-2000 TOX Analyzer with data system	1	98023001	
Chemistry	Horizon Oil and Grease Analyzer System	1	06-2059	2006
Chemistry	UCT-Enviro-Clean Universal Oil and Grease XF	1		2010
Chemistry	Shamidzu Spectrophotometer UV1700	1	A110244	2007
Chemistry	Mettler AE163 Scale	1	D14314	
Chemistry	Mettler AE163 Scale	1	WB1225	
Chemistry	Mettler AE200 Scale	1	J79480	
Chemistry	Mettler PE3000 Scale	1	F17120	
Chemistry	Denver APX-323 Scale	1	A33015028	
Chemistry	Sartorius BA61 Scale	1	30701480	
Chemistry	Labconco 65200-00 Rapidstill II		051044717E	
Chemistry	Labconco 65200-00 Rapidstill II	1	990192069E	
Chemistry	Fisher Scientific Coulomatic K-F Titrimeter	1	842	
Chemistry	Beckman TJ-6 Centrifuge	1	7A055	
Chemistry	Eppendorf 5415C Centrifuge	1	5415B67934	
Chemistry	Drying Oven Precision/Thelco130DM	1	605031244	
Chemistry	Drying Oven – Scientific Products DX31	1	124030	
Chemistry	PH Meter Beckman 31	1	K711071	
Chemistry	PH Meter Thermo ORION 720A	1	67511	
Chemistry	PH Meter Thermo ORION 710A	1	57736	
Chemistry	Turbidity Meter Hach 2100N	1	99020000-5174	
Chemistry	*Turbidity Meter Orbeco TB-200-10*	1	?	*2010*
Chemistry	Conductivity Meter Thermo/Orion 3 Star	1	16835	2007
Chemistry	pH/ISE Bench Top Thermo/Orion DualStar	1	E01600	
Chemistry	Fume Hoods	6		

Chemistry	Water Baths	3	2 Fisher120, 1Precision180	
Chemistry	BOD Incubator	3	Fisher307	
Chemistry	Refrigerator	1		
Chemistry	Rapid Digestor Labconco 23012	1	990891743E	
Chemistry	Heater/Stirrer Fisher Isotemp	1	504N0178	
Chemistry	Heater Thermolyne Cimerac 3	1		
Chemistry	Shaker Erbach 6000	1	402N0036	2007
Fish Toxicity	*5* Gallon Tanks	*130*		
Fish Toxicity	Disposable Tanks (approx. 3 Gallons each)	100		
Fish Toxicity	30 Gallon Tank	3		
Fish Toxicity	*25* Gallon Tank	*2*		
Fish Toxicity	Air Pumps	10		
Fish Toxicity	Circulation Pump	1		
Fish Toxicity	pH Meter	1		
Fish Toxicity	Recording Thermograph	1		
Fish Toxicity	YSL Model 50B DO Meter	1		
VOA-GC	Varian 3400 GC with FID & PID (VOA-GC3), concentrator LSC 2000 and Data System	1		1991
VOA-GC	Varian 3400 star GC with FID & PID, Archon autosampler, concentrator Tekmar 3000 and data system (VOA-GC1)	1		1989
VOA-GC	Varian 3300 GC with FID & PID, Archon Aautosampler, concentrator *O-I 4560* and data system (VOA-GC2)	1		1989
VOA-GC	Varian 430 GC with FID, autosampler CP 8400 and data system (SVOA-GC22)	1	GC0901B304	2009
VOA-GC	Agilent 6890N GC with FID, autosampler 7683B and data system (SVOA-GC20)	2	CN44130843 CN10540091	2005
VOA-GC	Varian CP-3800 GC with FID & PID, Archon autosampler, concentrator LSC *3000* and data system (VOA-GC6)	1		1999
VOA-GC	Varian CP-3800 GC with FID & PID, Archon autosampler, Tekmar *2000* concentrator and data system (VOA-GC5)	1		2004
VOA-GC	Varian 3300 GC with FID, and data system (VOA-GC4)	1		1986
VOA-GC	Varian 3400 GC with FID, Varian 8100 autosampler and	1		1990

	data system (SVOA-GC21)			
VOA-GC	Varian 3400 GC with TCD (VOA-GC7)	1		1988
VOA-GC	TCLP Rotary Agitators - ZHE	1		
VOA-GC	TCLP ZHE Extractors	4		
VOA-GC	TCLP Pressure Filters	2		
VOA-GC/MS	Varian Model 3800 gas chromatograph with Varian Saturn 2200 MS Detector, Archon Autosampler, Tekmar velocity concentrator and Data Station (VOA-MS7) *6.6*	1	04575-10060 14086	2003
VOA-GC/MS	Varian Model GC3900 with Saturn 2100T, Archon Autosampler, Teckmar Concentrator LSC3100 and MS Workstation 6.9	1	2100T-6508102076	2008
VOA-GC/MS	Varian Model 3800 gas chromatograph with Varian Saturn 2000 MS Detector, Archon Autosampler, Tekmar LSC 3000 and Data Station (VOA-MS6) *6.9*	1	4443-6028 13329	2001
VOA-GC/MS	Varian Model 3800 gas chromatograph with Varian Saturn 2000 MS Detector, Archon Autosampler, Eclipse 4660 and Data Station (VOA-MS5) *6.9*	1	3810-3780 0632466635 13073	1999
VOA-GC/MS	Varian Model 3800 gas chromatograph with Varian Saturn 2000 MS Detector, Archon Autosampler, LSC 3100 and Data Station (VOA-MS4)*6.9*	1	3811-3781 13345	1999
VOA-GC/MS	Varian Model 3800 gas chromatograph equipped with Varian Saturn Model 2000 MS Detector (VOA-MS3), Archon Autosampler, Tekmar Velocity XPT autosampler and Data Station *6.9*	1	Saturn2000-3792 13075	2005
VOA-GC/MS	Varian Model 3800 gas chromatograph equipped with Varian Saturn Model 2000 MS Detector, 2 flame ionization detectors, and a Lotus air sampling system. **(VOA-MS1)*6.9***	1	2000-48397315	2001

VOA-GC/MS	*Shimadzu GC-2010/GCMS-QP2010 Entech Model 7100AR Concenrator, Entech 7016CA 2.53 Lab Solution*	1		2010
Microbiology	Castle Thermatic 60, 20x24 Autoclave, Automatic	1		
Microbiology	Market Forge Sterilmatic Autoclave	1		
Microbiology	Wesco, 4 Objective Microscope	1		
Microbiology	B&L Dissecting Microscope	1		
Microbiology	Lab-Line Imperial III Incubator	1		
Microbiology	Baush & Lomb Refractometer	1		
Microbiology	VWR 1555 Incubator	1		
Microbiology	VWR Incubator, 40 cubic ft.	1		
Microbiology	Thermo Scientific Waterbath	1		
Microbiology	Fisher Scientific CO2 Incubator	1		
Microbiology	Baxter Scientific Product Vortex Mixer	1		
Microbiology	Sartorium Universal Balance	1		
Microbiology	Colony Counter	1		
Office Data Handling	Brother Fax	2	MFC-8460N	
Office Data Handling	Kyocrea Copiers and Printers	6	KM-8030 KM-4050 KM-2560(4)	
Office Data Handling	LIMs Computer System (39 stations)	1		
Office Data Handling	Sample Master Version 8.0	1		
Office Data Handling	HP Laserjet Printers	4		
Office Data Handling	Kyocera Ecosys Printer	2		
Office Data Handling	Lexmark Printers(T-644, 622, 520)	3		
SVOA	Agilent 6890N gas chromatograph with a Agilent 5973 Mass Selective Detector and a Agilent 7683B automatic injector	1	CN10502043 US44647151 Cn45131647	2005
SVOA	Shimadzu 2010 GCMS	1	C70384350031	2006
SVOA	Hewlett Packard 5890A Series II GC, dual ECD detectors, Autosampler and Data Station	1	3022A28956	1990
SVOA	Varian 3400 GC, dual ECD detectors, Autosampler (GC-3400)	1	14304	1991
SVOA	Varian 3800 GC, dual ECD detectors, Autosampler (GC#1)	1	2771	

SVOA	Varian 3800 GC, dual ECD & PFPD detectors, Autosampler (GC#2)	1	6056	2000
SVOA	Varian 3800 GC, dual ECD & PFPD detectors, Autosampler (GC#3)	1	9085	2000
SVOA	Varian 3400 GC, FID detector, Autosampler (GC-Alcohol)	1	6692	1989
SVOA	Waters Dimension II GC, ECD & FID detectors, data system	1	GC2-8901009	
SVOA	Shimadzu SCL-10A VP System Controller, LC-10AT Pumps, Autosampler, SPD-M10A VP Diode Array Detector, Data System	1	C2103750927US	2000
SVOA	Shimadzu GC-2010, dual injectors, dual ECD detectors (ECD#1, ECD#2), Autosampler and workstation	1	C11324101922	2003
SVOA	Dionex ASE 200 Accelerated Solvent Extractor and Controller	1	1060057	2001
SVOA	Dionex ASE 200 Accelerated Solvent Extractor and Controller	1	97060620	2000
SVOA	Zymark Turbo Vap II Concentration Workstations	3		2000
SVOA	Ohaus Brainweight B1500D Toploader Balance	1	11532	
SVOA	Boekel 1494 Steambath	1		
SVOA	Fisher Isotemp 228 Steambath	2		2000
SVOA	Fume Hoods	5		
SVOA	Varian 3300 GC (Drying Oven)	1	5415	1988
SVOA	B. Braun Braun-Sonic U Ultrasonic probe and generator	1		
SVOA	VWR 1350G Drying Oven, gravity	1		
SVOA	Precision Scientific 16 Drying Oven, gravity	1		
SVOA	National Appliance Drying Oven, gravity	1		
TOC/RAD	Gas-Flow proportional counting system -- Protean Instr., Model 9025.	1		1991
TOC/RAD	Geiger-Mueller Counter (portable) -- S.E. Intl. Model 4EC	1		1991
TOC/RAD	Infrared Heater and Stand (Fisher Scientific, Model 11-504-5	1		1991

TOC/RAD	Labconco Model 59000 Chemical Fume Hood	1		1991
TOC/RAD	Mettler Model H35AR Analytical Balance	1		
TOC/RAD	Dessicator, Nalgene Model 8-642-21	1		1991
TOC/RAD	TOC Analyzer, Shimadzu, TOC-5000	1		
TOC/RAD	Shimadzu TOC-VCSH Total Organic Carbon Analyzer, A/S and Data System	1		2004
AA/ICP Metals	PE Sciex Elan 6100 ICP-MS with auxiliary data system and Cetac autosampler/diluter	1	1680004	2000
AA/ICP Metals	Perkin Elmer Optima 4300DV ICP with AS93+ autosampler and data system		077N1091901	2001
AA/ICP Metals	Perkin Elmer Aanalyst 100 AA	1	040S0110603	2001
AA/ICP Metals	MSI Computer	1		2006
AA/ICP Metals	TCLP Rotary Agitators	2		
AA/ICP Metals	Air Compressor – Craftsman	1		
AA/ICP Metals	Fume Hood – 6 Ft.	2		
AA/ICP Metals	Safeaire Fume Hood – 4 Ft	2		
AA/ICP Metals	Environmental Express Hot Blocks	2		

APPENDIX E

STANDARD OPERATING PROCEDURE FOR DETERMINATION AND UPDATING OF MDL/DLR DETECTION LIMITS

PURPOSE

1. This Standard Operating Procedure summarizes the procedure for determining MDLs (Method Detection Limit) and DLR (Reporting Detection Limit), in addition to the procedure for updating and revising current MDLs and DLRs.

DETERMINATION OF MDL

1. Prepare and analyze seven replicate spike solutions:

    1.1. Prepare one spiked bulk solution for each matrix at 1-5 times the estimated detection limit. The volume should be sufficient to prepare and analyze seven or more samples. The solution should be spiked with all analytes of interest.

    1.2. Prepare seven or more aliquots of the spiked solution per the normal method of preparation (process through the entire analytical method).

    1.3. Analyze all the aliquots by normal analysis procedures (QA samples such as spikes, duplicates, LCS and PB are not required).

    1.4. Calculate the standard deviation (n-1) of the seven results. For seven replicates multiply by 3.14 to calculate the MDL value for each analyte. (**NOTE:** Use the factor 3.14 only for seven replicates, other factors are given in the EPA reference noted below).

    1.5. More than 7 aliquots can be analyzed. If more than 7 aliquots are analyzed, then all values must be used in calculating the MDL. Use the Student's t value at the 99% confidence level for the number of replicates.

2. The MDL should be determined at least once a year for each analyte, each analytical method and each matrix (solid, water, etc). The MDL should be re-run whenever there is a significant change in instrumentation or procedure.

3. An MDL check sample at approximately 2 x MDL should be analyzed to verify the reasonableness of the MDL values obtained. The MDL check sample should be prepared the same way as the MDL check solutions. All analytes should be detected in the MDL check sample, or the MDL study should be modified and repeated for the analytes which are not detected.

DETERMINATION OF REPORTING DETECTION LIMIT (DLR)

1. Prepare and analyze one or more samples at the estimated reporting limit:

   1.1. Prepare one or more samples at the estimated reporting limit using the normal preparation procedure (process through the entire analytical method). QA samples such as spikes, duplicates, LCS and PB are not required.

   1.2. Analyze the sample by the normal analysis procedure.

   1.3. The analytical result must be 75-125 percent of the spike value. If not, increase the concentration until this accuracy can be achieved.

2. The concentration at which the spike recovery of 75-125% can be achieved is the Reporting Detection Limit (DLR).

UPDATING & REVISING MDL/DLR VALUES:

1. Every year, each department is required to submit their MDLs for each analyte and each analytical method to the QC department.

2. The QC department will then incorporate the current MDLs into the LIMS system for each analytical method (**NOTE:** In the LIMS, there may be several test codes for a particular analytical method. It is important that the MDLs for ALL test codes in the LIMS be updated).

3. After the MDLs for a particular test have been changed, the specs for that test are printed out and kept on file by the QC department, and a copy is returned to the analyst.

4. The QC department shall keep track of all changes in the MDLs through an MDL Master Tracking List, which contains the following information:

   4.1. The date the MDL for a particular test was updated.

   4.2. The date the MDL was run.

   4.3. The LIMS test code and test name for each test in which the MDLs have been updated.

   4.4. The corresponding analytical method for each test.

   4.5. Any additional comments for documenting any pertinent information or noting any unusual peculiarities in the database (e.g., some analytes that are missing DLRs, MDLs that are greater than the DLR, etc.).

5. The MDL must never exceed the DLR. If the MDL is equal to or greater than the DLR then the following steps must be taken:

   5.1. If the MDL is greater than the DLR for one or more analytes, then the MDL should be re-run or the DLR should be adjusted if possible.

5.2. If the MDL is equal to the DLR, then this must be reviewed by the QC department as well as the department supervisor to determine if such a scenario is acceptable.

5.3. All cases in which the MDL is greater than or equal to the DLR, including any steps taken to remedy the situation, must be noted in the MDL Master Tracking List.

REFERENCES:

1. 40 CFR, Chapter 1, Pt. 136, App.B (7-1-86 Ed).

2. NELAC Quality Systems Revision 16, July 12, 2002.

APPENDIX F

NON-CONFORMANCE CRITERIA AND DOCUMENTATION PROCEDURES

QA Samples - Corrective Actions:

1. Lab Control Sample (LCS- W for water samples, S for soil samples), the acceptance criteria for the LCS is 80 - 120 percent of true value or the current control limits. If not, all samples in the batch must be re-prepared and re-analyzed.

2. Method Blank (MBW for water samples, MBS for soil samples), the result must be less than the reporting limit for each element, or less than 1/10 the lowest sample in the batch. If not, all samples in the batch must be re-prepared and re-analyzed.

3. Matrix Spike Sample (MS), recovery should be 75 - 125, if not the sample result should be flagged for potential matrix interference for each element showing poor recovery. (For metals analyses, a post- digestion spike should be done for any element with poor matrix spike recovery).

4. Matrix Spike Duplicate (MSD), the relative percent difference between the MS and MSD should be less than 20 percent. If not the analysis should be repeated or the result flagged for precision out of limits.

5. Surrogate Recovery, the surrogate recoveries should be within the current control limits for all methods where surrogate recoveries apply. If the surrogate recoveries are outside control limits, the results should be flagged for potential matrix interference for each analyte showing recovery outside the control limits. If the surrogate recoveries for the LCS or Method Blank are outside control limits, all samples in the batch must be re-prepared / re-analyzed, unless it can be determined that the poor recovery was due to a problem specific to that sample only.

Non-conformance Documentation Form (NCD):

1. Non-conformances such as QA limit failures which can not be corrected by re-analyses, client requirements which cannot be met or standard method modifications are documentated by initiating a Non-Conformance Document Form (NCD). A copy of the NCD Form is attached.

2. The NCD form is initiated by the analyst in the event of a QC sample exceeding control limits or other known non-conformance to the analytical method or client requirements. The NCM may also be initiated by the project manager or department manager in the event client requirements are not met or other analytical problems are discovered.

3. After the NCD Form is initiated, the corrective action must be determined and agreed upon by the department manager or supervisor and the QA Manager. This is documented and signed by the department manager in the second part of the NCD

Form. The form is then forwarded to the QA Manager.

4. The QA Manager then completes and signs the final part of the form. If necessary, verification of the corrective action is documented in this section.

5. A copy of the form is included in the affected data package or the client is notified as appropriate. The original is filed in the Corrective Actions File which is maintained by the QA Manager.

Associated Laboratories

Non-Conformance Document

Date: _____ Document File #:

_____

Lab Request: _____ Type of

NCD:_____

Client ID: _____ *(QA Limits, Client Req, Other)*

Department: _____

Description of Non-Conformance:
Signed (Initiator) _____ Date: _____

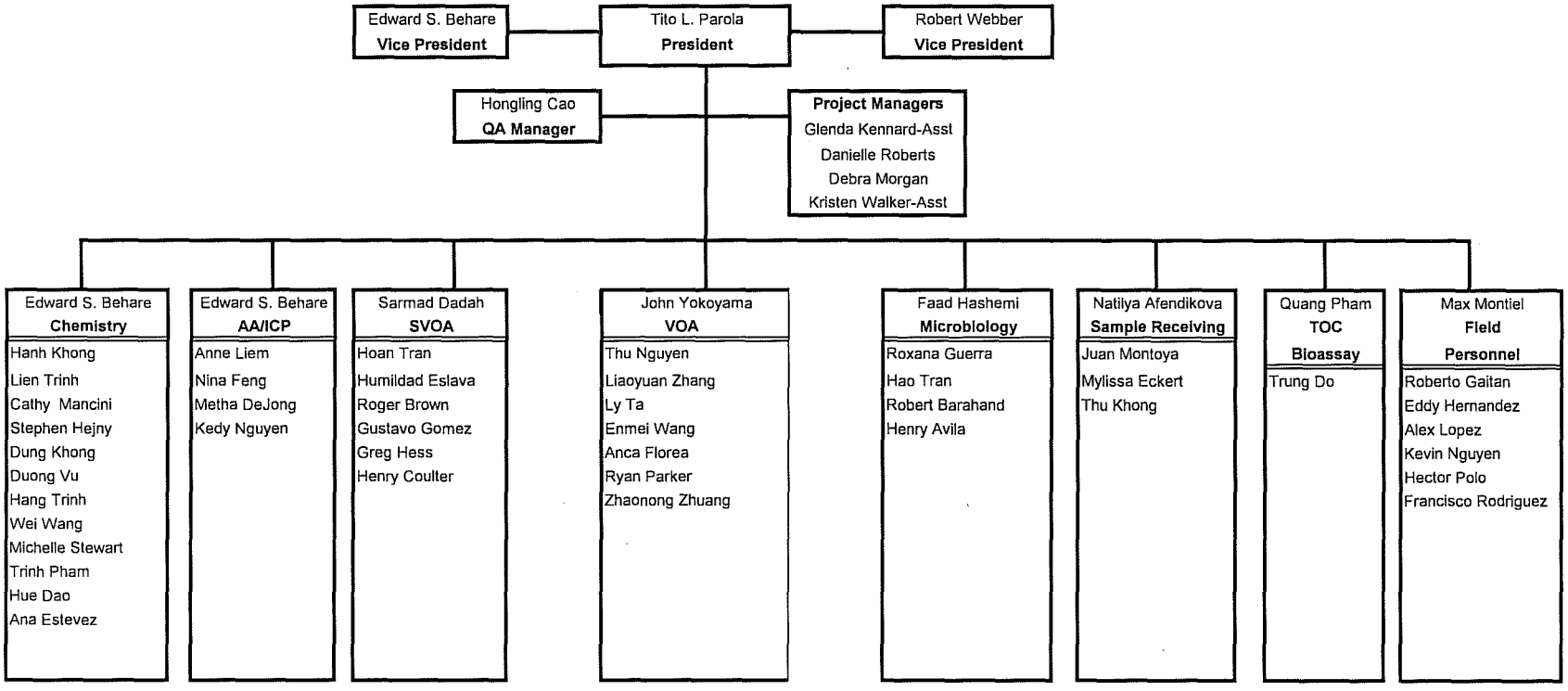
Description of Corrective Action:
Signed (Supervisor): _____ Date: _____

QA Manager Approval:
Signed (QA Manager): _____ Date: _____

APPENDIX G

ORGANIZATION CHART

ASSOCIATED LABORATORIES
LAB ORGANIZATION CHART



APPENDIX H

CURRENT STANDARD OPERATING PROCEDURES

Document #	**SOP**	**Test Method (if applicable)**	**Department**
A-0001	SOP for Writing SOPs		QC
A-0002	Updating/Control of SOPs		QC
QA Manual	SOP for MDLs		QC
A-0004	Control Charts		QC
QA Manual	Non-Conformance		QC
A-0006	Data Packaging		QC
A-0007	Ethics and Data Integrity Policies and Training		QC
A-0008	Internal Quality Audit Program		QC
A-0009	Purchasing services and supplies		QC
A-0010	Document Control		QC
A-0011	Subcontracting Laboratory Analyses		QC
A0012	Data Backup and Verification Procedure		QC
A0013	Data Auditing and Access Procedures		QC
A0014	PT Samples		QC
A0015	Imported Soils		QC
B-0003	8015 Diesel SOP	EPA 8015 Diesel	VOA-GC
B-0004	8015 gas/BTEX SOP	EPA 8015 Gas/8021 BTEX	VOA-GC
B-0005	TRPH SOP	EPA 418.1	VOA-GC
B-0007	Dissolved Gas in Water by GC Headspace	RSK - 175	VOA-GC
B-0008	8015/8021Air		VOA-GC
B-0009	8015CarbonChain	EPA 8015B	VOA-GC
C-0001	Purgeable Organics	EPA 524.2	VOA-GCMS
C-0002	Purgeable Organics	EPA 624	VOA-GCMS
C-0003	SVOCs by GC/MS	EPA 625	VOA-GCMS
C-0004	VOCs by GC/MS	EPA 8260B	VOA-GCMS
C-0005	SVOCs by GC/MS	EPA 8270C	VOA-GCMS
D-0001	Acidity	EPA 305.1 / SM 2310B	Chemistry
D-0002	Alkalinity	EPA 310.1 / SM 2320B	Chemistry
D-0003	pH	EPA 150.1 / SM 4500H-B	Chemistry
D-0004	TDS	EPA 160.1 / SM 2540C	Chemistry

D-0005	TSS	EPA 160.2 / SM 2540D	Chemistry
D-0006	Volatile Solids	EPA 160.4 / SM 2540E	Chemistry
D-0007	Anions by IC	EPA 300 / SM 4110	Chemistry
D-0008	Bromide by IC	EPA 300.1	Chemistry
D-0009	Perchlorate	EPA 314	Chemistry
D-0010	Cyanide	EPA 335.1 & 335.2 / SM 4500-CN / SW846 9010B	Chemistry
D-0011	Ammonia-N	EPA 350.1 / SM 4500-NH3-G	Chemistry
D-0012	TKN	EPA 351.2 / SM 4500-Norg	Chemistry
D-0013	TKN	EPA 351.3 / SM 4500-Norg	Chemistry
D-0014	Nitrate/Nitrite-N	EPA 353.2 / SM 4500-NO3-E	Chemistry
D-0015	Total/Ortho-P	EPA 365.2	Chemistry
D-0016	TKP	EPA 365.4	Chemistry
D-0017	Mercury in Water	EPA 245.1 / SW846 7470A	Chemistry
D-0018	Reactive Cyanide	SW846-7.3.3	Chemistry
D-0019	Reactive Sulfide	SW846-7.3.4	Chemistry
D-0020	Oil & Grease	EPA 1664	Chemistry
D-0021	BOD	EPA 405.1 / SM 5210B	Chemistry
D-0022	COD (Hach)	EPA 410.4	Chemistry
D-0023	Silica	EPA 370.1 / SM 4500 Si-D&E	Chemistry
D-0024	Sulfide (Iodometric)	EPA 376.1 / SM 4500S / SW846 9034	Chemistry
D-0026	Total Phenolics	EPA 420.1 / SM 5530 / SW846 9065	Chemistry
D-0027	Chlorine	EPA 330.5 / SM 4500Cl-G	Chemistry
D-0028	UV absorbance	SM 5910B	Chemistry
D-0029	Settleable Solids	EPA 160.5 / SM 2540F	Chemistry
D-0030	Conductivity	EPA 120.1 / SM 2510 / SW846 9050A	Chemistry
D-0031	Turbidity	EPA 180.1 / SM 2130B	Chemistry

D-0032	Corrosivity	EPA 1110	Chemistry
D-0033	COD (Titrimetric)	EPA 410.1, 410.2 & 410.3 / SM 5220B	Chemistry
D-0035	Ignitability	SW846 1010	Chemistry
D-0036	Sulfide (Colorimetric)	EPA 376.2 / SM 4500S-D	Chemistry
D-0037	Fluoride	EPA 340.2 / SM 4500F-C / SW846 9214	Chemistry
D-0038	Cyanide	EPA 335.4 / SW846 9012A	Chemistry
D-0039	Ammonia-N (Titration)	EPA 350.2 / SM 4500-NH3-C	Chemistry
D-0040	Total Solids	EPA 160.3 / SM 2540B	Chemistry
D-0041	Color	EPA 110.2 / SM 2120B	Chemistry
D-0042	Cr (VI)	SM 3500 Cr-D / SW846 7196A	Chemistry
D-0043	Cr (VI) by IC	EPA 218.6	Chemistry
D-0045	MBAS	EPA 425.1 / SM 5540C	Chemistry
D-0046	Chloride (titration)	EPA 325.3 / SM 4500-Cl	Chemistry
D-0047	DO (Probe)	EPA 360.1 / SM 4500-O-G	Chemistry
D-0048	DO (Titration)	EPA 360.2 / SM 4500-O-C	Chemistry
D-0049	pH in Soil	SW846 9045C	Chemistry
D-0050	Mercury in Solid	SW846 7471A	Chemistry
D-0051	Total Sulfides	SW846 9030B	Chemistry
D-0052	Cr (VI)	EPA 7199	Chemistry
D-0053	Oil and Grease For Soil	EPA 9071B	Chemistry
D-0054	pH for Soil	EPA 9040B	Chemistry
D-0055	Total and Amendable CN Automation	SW846 9012A	Chemistry
D-0056	Total and Amendable CN Manual	SW846 9014	Chemistry
D-0057	Sulfite	EPA 377.1	Chemistry
D-0058	Salinity	SM210-C	Chemistry
E-0001	Micro- CC	Control Cultures	Microbiology
E-0002	Micro-HPT	Heterotrophic Plate Count	Microbiology
E-0003	Micro-MNO/MUG	Coliform by MNO-MUG	Microbiology
E-0004	Micro-Coliform (MTF)	Coiliform by MTF in Waste Water	Microbiology
E-0005	Micro-Coliform (MTF)	Coliform by MTF in Drinking	Microbiology

		Water	
E-0006	Micro - Strep (MF)	Strep by MF	Microbiology
E-0007	Micro - Strep (MTF)	Strep by MTF	Microbiology
E-0008	Micro - Autoclave	Water Suitability	Microbiology
E-0009	Micro - WS	Coliform by MTF in Drinking Water	Microbiology
E-0010	Micro - Inhibitory Residue		Microbiology
E-0012	Micro – Coliform (MF)	Coliform by MF in Waste Water	Microbiology
E-0014	Micro Sampling		Microbiology
F-0001	Metals by ICP	EPA 200.7	Metals
F-0002	Metals by ICP	EPA 6010B	Metals
F-0003	Metals by ICP-MS	EPA 200.8	Metals
F-0004	Metals by ICP-MS	EPA 6020	Metals
F-0005	Metals by AA	EPA 7420 / SM 3111B	Metals
F-0006	STLC	STLC	Metals
F-0007	TCLP	EPA 1311	All applicable labs
F-0008	Metals Prep	EPA 3010A	Metals
F-0009	Metals Prep	EPA 3050B	Metals
G-0001	TOC	EPA 415.1 / SM 5310B	TOC/Bioassay
G-0005	Aquatic Bioassay 013	EPA 600/4-85/013	TOC/Bioassay
G-0006	Reference Toxicant 013	EPA 600/4-85/013	TOC/Bioassay
G-0007	Aquatic Bioassay 027F	EPA 600/4-85/027F	TOC/Bioassay
G-0008	Reference Toxicant 027F	EPA 600/4-85/027F	TOC/Bioassay
G-0009	Aquatic Bioassay in Hazardous Waste		TOC/Bioassay
G-0010	Reference Toxicant in Hazardous Waste		TOC/Bioassay
G-0011	Aquatic Toxity Bioassay-B		TOC/Bioassay
H-0001	Organochlorides	EPA 608	Pesticides
H-0002	Organochlorides	EPA 8081	Pesticides
H-0003	PAHs	EPA 8310	Pesticides
H-0004	PCBs	EPA 8082	Pesticides
H-0005	Chlorinated Phenoxy-Herbicides by GC	EPA 8151	Pesticides
H-0006	L-L Extraction	EPA 3510C	Pesticides

H-0007	Ultrasonication	EPA 3550B	Pesticides
H-0008	PF Extraction	EPA 3545	Pesticides
H-0009	EDB, DBCP & TCP by GC	EPA 504.1	Pesticides
H-0010	EDB & DBCP by GC	EPA 8011	Pesticides
H-0011	OP Pesticides by GC	EPA 8141	Pesticides
H-0012	Haloacetic Acids	EPA 552.2	Pesticides
H-0013	1,4-Dioxane (NDMA, NDEA)	EPA1625M	Pesticides
J-0001	Inorganics Glassware Cleaning		All applicable labs
J-0002	Thermometer Cal.		All applicable labs
J-0003	Balance Calibration		All applicable labs
J-0004	Reagent Water Mon.		All applicable labs
J-0005	Pipette Calibration		All applicable labs
J-0007	Soil Sub-Sampling and Compositing		All applicable labs
J-0008	Field Sampling		Sample Receiving
J-0009	Organic Glassware Cleaning		All applicable labs
J-0010	Laboratory Hazardous Waste Disposal		All applicable labs
J-0011	Analytical Standards		All applicable labs
J-0012	Project Management		All applicable labs
J-0013	Retention Time Windows		All applicable labs
J-0014	sampling and chain of custody procedures		All applicable labs
J-0016	Preparation of Sample Containers-Preservatives		All applicable labs

J-0017	Manual Integration	All applicable labs
J-0018	pH MEASUREMENT AND METER MONITORING for Field	Field Personnel

SOP Revision Schedule

Department	Document #	SOP Revision Month
QC	A-####	July
Gas/BTEX	B-####	July
GCMS	C-####	July
Chemistry	D-####	July
Microbiology	E-####	July
Metals	F-####	August
Radiochemistry/Bioassay/ TOC	G-####	August
Pesticides	H-####	September
Others	J-####	September

APPENDIX I

SAMPLE RECEIVING CHECKLIST

ASSOCIATED LABORATORIES
806 North Batavia – Orange, California 92868 – 714-771-6900 *FAX 714-538-1209*

SAMPLE ACCEPTANCE CHECKLIST

Section 1
Client:_____ Project:_____
Date Received:_____ Sampler's Name: Yes No
Sample(s) received in cooler: Yes No (Skip Section 2)
Shipping Information:_____

Section 2
Was the cooler packed with: ____ Ice ____ Ice Packs ___ Bubble Wrap ___ Styrofoam
____ Paper ____None ___ Other_____
Cooler or box temperature: _____

(Acceptance range is 2 to 6 Deg. C.)

Section 3	YES	NO	N/A
Was a COC received?			
Is it properly completed? (IDs, sampling date and time, signature, test)			
Were custody seals present?			
If Yes – were they intact?			
Were all samples sealed in plastic bags?			
Did all samples arrive intact? If no, indicate below.			
Did all bottle labels agree with COC? (ID, dates and times)			
Were correct containers used for the tests required?			
Was a sufficient amount of sample sent for tests indicated?			
Was there headspace in VOA vials?			
Were the containers labeled with correct preservatives?			
Was total residual chlorine measured (Fish Bioassay samples only)? *			

*: If the answer is no, please inform Fish Bioassay Dept. immediately.

Section 4
Explanations/Comments

Section 5
Was Project Manager notified of discrepancies: Y / N N/A

Completed By: _____ Date: _____

APPENDIX J

SAMPLE OF LAB REQUEST SUMMARY

ASSOCIATED LABORATORIES LAB REQUEST SUMMARY

Client ID: **1000**

Some Client
Attn: BB
1234 Marvel Way
New York, NY 20007

Phone:209-200-2001 Fax: 209-200-2002

Submitter: Client

Project: Some Project

Lab Request: 158450

Date Received: 10/17/2005

Project Mgr.: JMM

REVIEW	BY	DATE
LOG IN		
DATA		
QC		
FINAL RPT		

FAX RESULTS

Order No.: 658819 **Matrix:** WATER **Log Date:** 10/17/2005@15:15 **Due Date:** 10/24/2005
Client Smpl. ID: Sample 1 **Sampled:** 10/17/2005 **Status:** Logged

Method	Profile	Test Name	Analyte	Service Group
120.1		120.1 Conductivity	All	CHEM
150.1		150.1 pH	All	CHEM
1664		1664 Oil and Grease	All	CHEM
300.0		300.0 Nitrate as NO3 by Ion Chromatography	All	CHEM
300.0		300.0 Sulfate by Ion Chromatography	All	CHEM
300.0		300.0 Chloride by Ion Chromatography	All	CHEM

Order No.: 658820 **Matrix:** WATER **Log Date:** 10/17/2005@15:15 **Due Date:** 10/24/2005
Client Smpl. ID: Sample 2 **Sampled:** 10/17/2005 **Status:** Logged

Method	Profile	Test Name	Analyte	Service Group
200.7		200.7 ICP Total Metals - Water Only	Calcium	AA/ICP
200.7			Copper	AA/ICP
200.7			Lead	AA/ICP
200.7			Magnesium	AA/ICP
200.7			Potassium	AA/ICP
200.7			Sodium	AA/ICP
245.1		245.1 Mercury in Water by Manual Cold	All	CHEM

Logged By: JIM

ASSOCIATED LABS RESULTS WORKSHEET FOR LAB REQUEST 158,450

Order #: 658819 **Client Smpl ID:** Sample 1 **Matrix:** WATER

Test #	Analyte	An. Date	Init.	DF	Result	DLR	Units
120.1	Conductivity					1.0	umhos/cm
150.1	pH						NA
1664	Non-Polar Oil and Grease					5	mg/L
1664	Total Oil and Grease					5	mg/L
300.0	Chloride					1.0	mg/L
300.0	Nitrate (as NO3)					0.44	mg/L
300.0	Sulfate					1.0	mg/L

Comments: _____

Order #: 658820 **Client Smpl ID:** Sample 2 **Matrix:** WATER

Test #	Analyte	An. Date	Init.	DF	Result	DLR	Units
245.1	Mercury					0.0004	mg/L

Comments: _____

DLR = Detection limit for reporting purposes. DF = Dilution factor. An. Date = Date of analysis. Init = Analyst initials

AA/ICP

ASSOCIATED LABS RESULTS WORKSHEET FOR LAB REQUEST 158,450

Order #: 658820 **Client Smpl ID:** Sample 2 **Matrix:** WATER

Test #	Analyte	An. Date	Init.	DF	Result	DLR	Units
200.7	Calcium					0.10	mg/L
200.7	Copper					0.010	mg/L
200.7	Lead					0.005	mg/L
200.7	Magnesium					0.10	mg/L
200.7	Potassium					0.50	mg/L
200.7	Sodium					0.10	mg/L

Comments: _____

DLR = Detection limit for reporting purposes. DF = Dilution factor. An. Date = Date of analysis. Init = Analyst initials

APPENDIX K

LISTING OF NELAP AND CALIFORNIA ELAP ACCREDITED ENVIRONMENTAL METHODS

CDPH
California Department of
PublicHealth

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

ASSOCIATED LABORATORIES

806 N BATAVIA

ORANGE, CA 92868

Scope of the certificate is limited to the
"Fields of Testing"
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1338**

Expiration Date: **10/31/2010**

Effective Date: **10/01/2008**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

State of California—Health and Human Services Agency
California Department of Public Health

MARK B HORTON, MD, MSPH
Director

ARNOLD SCHWARZENEGGER
Governor

August 4, 2009

EDWARD S. BEHARE, Ph.D.
ASSOCIATED LABORATORIES
806 NORTH BATAVIA
ORANGE, CA 92868

Dear EDWARD S. BEHARE, Ph.D.: Certificate No. 1338

This is to advise you that the laboratory named above has been certified as an environmental testing laboratory pursuant to the provisions of the Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.

The Fields of Testing for which this laboratory has been certified are indicated on the enclosed "Fields of Testing." The certificate shall remain in effect until **October 31, 2010** unless it is revoked. This certificate is subject to an annual fee as prescribed by HSC 100860(a).

The application for renewal of this certificate must be received before the expiration date of this certificate to remain in force according to the HSC 100845(a).

Any changes in laboratory location or structural alterations, which may affect adversely the quality of analysis in the Fields of Testing for which this laboratory has been granted a certificate, require prior notification. Notification is also required for changes in ownership or laboratory director within 30 days after the change (HSC, Section 100845(b) and (d)).

Your continued cooperation with the above requirements is essential for maintaining the high quality of the data produced by environmental laboratories certified by the State of California.

If you have any questions, please contact Rosalinda Lomboy at (213) 580-5731.

Sincerely,

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

Enclosure

CDPH

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

ASSOCIATED LABORATORIES Lab Phone (714) 771-6900

806 N BATAVIA
ORANGE, CA 92868

Certificate No: 1338 **Renew Date: 10/31/2010**

Field of Testing: 101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM9215B
101.020	001	Total Coliform	SM9221A,B
101.021	001	Fecal Coliform	SM9221E (MTF/EC)
101.022	001	E. coli	CFR 141.21(f)(6)(i) (MTF/EC+MUG)
101.050	001	Total Coliform	SM9222A,B,C
101.051	001	Fecal Coliform	SM9221E (MF/EC)
101.070	002	Total Coliform	Colisure
101.070	003	E. coli	Colisure
101.120	001	Total Coliform (Enumeration)	SM9221A,B,C
101.130	001	Fecal Coliform (Enumeration)	SM9221E (MTF/EC)
101.140	001	Total Coliform (Enumeration)	SM9222A,B,C
101.150	001	Fecal Coliform (Enumeration)	SM9222D

Field of Testing: 102 - Inorganic Chemistry of Drinking Water

102.030	001	Bromide	EPA 300.0
102.030	002	Chlorate	EPA 300.0
102.030	003	Chloride	EPA 300.0
102.030	004	Chlorite	EPA 300.0
102.030	005	Fluoride	EPA 300.0
102.030	006	Nitrate	EPA 300.0
102.030	007	Nitrite	EPA 300.0
102.030	010	Sulfate	EPA 300.0
102.040	004	Bromate	EPA 300.1
102.045	001	Perchlorate	EPA 314.0
102.050	001	Cyanide	EPA 335.4
102.060	001	Nitrate calc.	EPA 353.2
102.061	001	Nitrite	EPA 353.2
102.100	001	Alkalinity	SM2320B
102.130	001	Conductivity	SM2510B
102.140	001	Total Dissolved Solids	SM2540C
102.145	001	Total Dissolved Solids	EPA 160.1
102.150	001	Chloride	SM4110B
102.150	002	Fluoride	SM4110B
102.150	003	Nitrate	SM4110B
102.150	004	Nitrite	SM4110B
102.150	006	Sulfate	SM4110B

102.163	001	Chlorine, Free and Total	SM4500-Cl G
102.190	001	Cyanide, Total	SM4500-CN E
102.192	001	Cyanide, amenable	SM4500-CN G
102.200	001	Fluoride	SM4500-F C
102.234	001	Nitrite	SM4500-NO3 F
102.234	002	Nitrate	SM4500-NO3 F
102.240	001	Phosphate, Ortho	SM4500-P E
102.260	001	Total Organic Carbon	SM5310B
102.261	001	DOC	SM5310B
102.270	001	Surfactants	SM5540C
102.280	001	UV254	SM5910B
102.500	001	Calcium	SM3111B
102.500	002	Magnesium	SM3111B
102.500	003	Potassium	SM3111B
102.500	004	Sodium	SM3111B
102.500	005	Hardness (calc.)	SM3111B
102.510	001	Calcium	SM3120B
102.510	002	Magnesium	SM3120B
102.510	003	Potassium	SM3120B
102.510	004	Silica	SM3120B
102.510	005	Sodium	SM3120B
102.510	006	Hardness (calc.)	SM3120B
102.520	001	Calcium	EPA 200.7
102.520	002	Magnesium	EPA 200.7
102.520	003	Potassium	EPA 200.7
102.520	004	Silica	EPA 200.7
102.520	005	Sodium	EPA 200.7
102.520	006	Hardness (calc.)	EPA 200.7
102.533	001	Silica	SM4500-Si D (18th/19th)
102.534	001	Silica	SM4500-Si E
102.535	001	Silica	SM4500-Si F
102.542	001	Silica	SM4500-SiO2 C (20th)
102.543	001	Silica	SM4500-SiO2 D (20th)

Field of Testing: 103 - Toxic Chemical Elements of Drinking Water

103.061	001	Aluminum	SM3120B (18th/19th/20th)
103.061	003	Barium	SM3120B (18th/19th/20th)
103.061	004	Beryllium	SM3120B (18th/19th/20th)
103.061	005	Cadmium	SM3120B (18th/19th)
103.061	007	Chromium	SM3120B (18th/19th/20th)
103.061	008	Copper	SM3120B (18th/19th/20th)
103.061	009	Iron	SM3120B (18th/19th/20th)
103.061	011	Manganese	SM3120B (18th/19th/20th)
103.061	012	Nickel	SM3120B (18th/19th/20th)

103.061	015	Silver	SM3120B (18th/19th/20th)
103.061	017	Zinc	SM3120B (18th/19th/20th)
103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	004	Beryllium	EPA 200.7
103.130	005	Cadmium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	015	Silver	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.130	018	Boron	EPA 200.7
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	011	Mercury	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	018	Vanadium	EPA 200.8
103.160	001	Mercury	EPA 245.1
103.310	001	Chromium (VI)	EPA 218.6
Field of Testing: 104 - Volatile Organic Chemistry of Drinking Water			
104.030	001	1,2-Dibromoethane	EPA 504.1
104.030	002	1,2-Dibromo-3-chloropropane	EPA 504.1
104.040	000	Volatile Organic Compounds	EPA 524.2
104.040	001	Benzene	EPA 524.2
104.040	007	n-Butylbenzene	EPA 524.2
104.040	008	sec-Butylbenzene	EPA 524.2
104.040	009	tert-Butylbenzene	EPA 524.2
104.040	010	Carbon Tetrachloride	EPA 524.2

104.040	011	Chlorobenzene	EPA 524.2
104.040	015	2-Chlorotoluene	EPA 524.2
104.040	016	4-Chlorotoluene	EPA 524.2
104.040	019	1,3-Dichlorobenzene	EPA 524.2
104.040	020	1,2-Dichlorobenzene	EPA 524.2
104.040	021	1,4-Dichlorobenzene	EPA 524.2
104.040	022	Dichlorodifluoromethane	EPA 524.2
104.040	023	1,1-Dichloroethane	EPA 524.2
104.040	024	1,2-Dichloroethane	EPA 524.2
104.040	025	1,1-Dichloroethene	EPA 524.2
104.040	026	cis-1,2-Dichloroethene	EPA 524.2
104.040	027	trans-1,2-Dichloroethene	EPA 524.2
104.040	028	Dichloromethane	EPA 524.2
104.040	029	1,2-Dichloropropane	EPA 524.2
104.040	033	cis-1,3-Dichloropropene	EPA 524.2
104.040	034	trans-1,3-Dichloropropene	EPA 524.2
104.040	035	Ethylbenzene	EPA 524.2
104.040	037	Isopropylbenzene	EPA 524.2
104.040	039	Naphthalene	EPA 524.2
104.040	041	N-propylbenzene	EPA 524.2
104.040	042	Styrene	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	045	Tetrachloroethene	EPA 524.2
104.040	046	Toluene	EPA 524.2
104.040	048	1,2,4-Trichlorobenzene	EPA 524.2
104.040	049	1,1,1-Trichloroethane	EPA 524.2
104.040	050	1,1,2-Trichloroethane	EPA 524.2
104.040	051	Trichloroethene	EPA 524.2
104.040	052	Trichlorofluoromethane	EPA 524.2
104.040	054	1,2,4-Trimethylbenzene	EPA 524.2
104.040	055	1,3,5-Trimethylbenzene	EPA 524.2
104.040	056	Vinyl Chloride	EPA 524.2
104.040	057	Xylenes, Total	EPA 524.2
104.045	001	Bromodichloromethane	EPA 524.2
104.045	002	Bromoform	EPA 524.2
104.045	003	Chloroform	EPA 524.2
104.045	004	Dibromochloromethane	EPA 524.2
104.045	005	Trihalomethanes	EPA 524.2
104.050	002	Methyl tert-butyl Ether (MTBE)	EPA 524.2
104.050	004	tert-Amyl Methyl Ether (TAME)	EPA 524.2
104.050	005	Ethyl tert-butyl Ether (ETBE)	EPA 524.2
104.050	006	Trichlorotrifluoroethane	EPA 524.2
104.050	007	tert-Butyl Alcohol (TBA)	EPA 524.2

104.050	008	Carbon Disulfide	EPA 524.2
104.050	009	Methyl Isobutyl Ketone	EPA 524.2
Field of Testing: 105 - Semi-volatile Organic Chemistry of Drinking Water			
105.200	001	Bromoacetic Acid	EPA 552.2
105.200	003	Chloroacetic Acid	EPA 552.2
105.200	004	Dalapon	EPA 552.2
105.200	005	Dibromoacetic Acid	EPA 552.2
105.200	006	Dichloroacetic Acid	EPA 552.2
105.200	007	Trichloroacetic Acid	EPA 552.2
105.200	008	Haloacetic Acids (HAA5)	EPA 552.2
Field of Testing: 107 - Microbiology of Wastewater			
107.010	001	Heterotrophic Bacteria	SM9215B
107.020	001	Total Coliform	SM9221B
107.040	001	Fecal Coliform	SM9221C,E (MTF/EC)
107.060	001	Total Coliform	SM9222B
107.080	001	Fecal Coliform	SM9222D
107.100	001	Fecal Streptococci	SM9230B
107.100	002	Enterococci	SM9230B
107.110	001	Fecal Streptococci	SM9230C (MF/ME)
107.110	002	Enterococci	SM9230C (MF/ME)
107.111	001	Fecal Streptococci	SM9230C (MF/m-Enterococcus)
107.111	002	Enterococci	SM9230C (MF/m-Enterococcus)
Field of Testing: 108 - Inorganic Chemistry of Wastewater			
108.020	001	Conductivity	EPA 120.1
108.090	001	Residue, Volatile	EPA 160.4
108.110	001	Turbidity	EPA 180.1
108.112	001	Boron	EPA 200.7
108.112	002	Calcium	EPA 200.7
108.112	003	Hardness (calc.)	EPA 200.7
108.112	004	Magnesium	EPA 200.7
108.112	005	Potassium	EPA 200.7
108.112	006	Silica	EPA 200.7
108.112	007	Sodium	EPA 200.7
108.113	001	Boron	EPA 200.8
108.113	002	Calcium	EPA 200.8
108.113	003	Magnesium	EPA 200.8
108.113	004	Potassium	EPA 200.8
108.113	005	Silica	EPA 200.8
108.113	006	Sodium	EPA 200.8
108.120	001	Bromide	EPA 300.0
108.120	002	Chloride	EPA 300.0
108.120	003	Fluoride	EPA 300.0
108.120	004	Nitrate	EPA 300.0

108.120	005	Nitrite	EPA 300.0
108.120	006	Nitrate-nitrite	EPA 300.0
108.120	008	Sulfate	EPA 300.0
108.183	001	Cyanide, Total	EPA 335.4
108.200	001	Ammonia	EPA 350.1
108.211	001	Kjeldahl Nitrogen	EPA 351.2
108.232	001	Nitrate-nitrite	EPA 353.2
108.323	001	Chemical Oxygen Demand	EPA 410.4
108.350	001	Total Recoverable Petroleum Hydrocarbons	EPA 418.1
108.360	001	Phenols, Total	EPA 420.1
108.381	001	Oil and Grease	EPA 1664A
108.390	001	Turbidity	SM2130B
108.400	001	Acidity	SM2310B
108.410	001	Alkalinity	SM2320B
108.420	001	Hardness (calc.)	SM2340B
108.430	001	Conductivity	SM2510B
108.440	001	Residue, Total	SM2540B
108.442	001	Residue, Non-filterable	SM2540D
108.443	001	Residue, Settleable	SM2540F
108.445	001	Calcium	SM3111B
108.445	002	Hardness (calc.)	SM3111B
108.445	003	Magnesium	SM3111B
108.445	004	Potassium	SM3111B
108.445	005	Sodium	SM3111B
108.447	001	Boron	SM3120B
108.447	002	Calcium	SM3120B
108.447	003	Hardness (calc.)	SM3120B
108.447	004	Magnesium	SM3120B
108.447	005	Potassium	SM3120B
108.447	006	Silica	SM3120B
108.447	007	Sodium	SM3120B
108.451	001	Chloride	SM4500-Cl- C
108.465	001	Chlorine	SM4500-Cl G
108.470	001	Cyanide, Manual Distillation	SM4500-CN C
108.472	001	Cyanide, Total	SM4500-CN E
108.473	001	Cyanide, amenable	SM4500-CN G
108.480	001	Fluoride	SM4500-F C
108.490	001	pH	SM4500-H+ B
108.492	001	Ammonia	SM4500-NH3 C (19th/20th)
108.495	001	Ammonia	SM4500-NH3 E (18th)
108.522	001	Nitrate-nitrite	SM4500-NO3 F
108.522	002	Nitrite	SM4500-NO3 F
108.530	001	Dissolved Oxygen	SM4500-O C

108.531	001	Dissolved Oxygen	SM4500-O G
108.540	001	Phosphate, Ortho	SM4500-P E
108.541	001	Phosphorus, Total	SM4500-P E
108.550	001	Dissolved Silica	SM4500-Si D (18th/19th)
108.551	001	Silica	SM4500-SiO2 C (20th)
108.560	001	Sulfite	SM4500-SO3 B
108.580	001	Sulfide	SM4500-S= D
108.582	001	Sulfide	SM4500-S= F (19th/20th)
108.590	001	Biochemical Oxygen Demand	SM5210B
108.591	001	Carbonaceous BOD	SM5210B
108.602	001	Chemical Oxygen Demand	SM5220D
108.610	001	Total Organic Carbon	SM5310B
108.630	001	Oil and Grease	SM5520B (20th)
108.640	001	Surfactants	SM5540C

Field of Testing: 109 - Toxic Chemical Elements of Wastewater

109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	003	Arsenic	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	019	Selenium	EPA 200.7
109.010	021	Silver	EPA 200.7
109.010	023	Thallium	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8
109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8

109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	017	Vanadium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.020	020	Gold	EPA 200.8
109.020	021	Iron	EPA 200.8
109.020	022	Tin	EPA 200.8
109.020	023	Titanium	EPA 200.8
109.104	001	Chromium (VI)	EPA 218.6
109.190	001	Mercury	EPA 245.1
109.370	010	Lead	SM3111B
109.430	001	Aluminum	SM3120B
109.430	002	Antimony	SM3120B
109.430	003	Arsenic	SM3120B
109.430	004	Barium	SM3120B
109.430	005	Beryllium	SM3120B
109.430	007	Cadmium	SM3120B
109.430	009	Chromium	SM3120B
109.430	010	Cobalt	SM3120B
109.430	011	Copper	SM3120B
109.430	012	Iron	SM3120B
109.430	013	Lead	SM3120B
109.430	015	Manganese	SM3120B
109.430	016	Molybdenum	SM3120B
109.430	017	Nickel	SM3120B
109.430	019	Selenium	SM3120B
109.430	021	Silver	SM3120B
109.430	023	Thallium	SM3120B
109.430	024	Vanadium	SM3120B
109.430	025	Zinc	SM3120B
109.811	001	Chromium (VI)	SM3500-Cr D (18th/19th)

Field of Testing: 110 - Volatile Organic Chemistry of Wastewater

110.040	040	Halogenated Hydrocarbons	EPA 624
110.040	041	Aromatic Compounds	EPA 624
110.040	042	Oxygenates	EPA 624
110.040	043	Other Volatile Organics	EPA 624

Field of Testing: 111 - Semi-volatile Organic Chemistry of Wastewater

111.060	000	Polynuclear Aromatics	EPA 610
111.101	032	Polynuclear Aromatic Hydrocarbons	EPA 625
111.101	033	Adipates	EPA 625
111.101	034	Phthalates	EPA 625
111.101	036	Other Extractables	EPA 625
111.170	030	Organochlorine Pesticides	EPA 608
111.170	031	PCBs	EPA 608
111.272	001	Oil and Grease	SM5520B (20th)
111.273	001	Oil and Grease	EPA 1664A

Field of Testing: 113 - Whole Effluent Toxicity of Wastewater

113.010	001A	Fathead Minnow (P. promelas)	EPA 600/4-90/027F, Static
113.021	001A	Fathead Minnow (P. promelas)	EPA 2000 (EPA-821-R-02-012), Static

Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste

114.010	001	Antimony	EPA 6010B
114.010	002	Arsenic	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.020	001	Antimony	EPA 6020
114.020	002	Arsenic	EPA 6020
114.020	003	Barium	EPA 6020
114.020	004	Beryllium	EPA 6020
114.020	005	Cadmium	EPA 6020
114.020	006	Chromium	EPA 6020
114.020	007	Cobalt	EPA 6020
114.020	008	Copper	EPA 6020
114.020	009	Lead	EPA 6020
114.020	010	Molybdenum	EPA 6020
114.020	011	Nickel	EPA 6020
114.020	012	Selenium	EPA 6020
114.020	013	Silver	EPA 6020
114.020	014	Thallium	EPA 6020

114.020	015	Vanadium	EPA 6020
114.020	016	Zinc	EPA 6020
114.103	001	Chromium (VI)	EPA 7196A
114.106	001	Chromium (VI)	EPA 7199
114.130	001	Lead	EPA 7420
114.140	001	Mercury	EPA 7470A
114.141	001	Mercury	EPA 7471A
114.221	001	Cyanide, Total	EPA 9012A
114.222	001	Cyanide	EPA 9014
114.230	001	Sulfides, Total	EPA 9034
114.240	001	Corrosivity - pH Determination	EPA 9040B
114.241	001	Corrosivity - pH Determination	EPA 9045C
114.270	001	Fluoride	EPA 9214
Field of Testing: 115 - Extraction Test of Hazardous Waste			
115.020	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
115.030	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.040	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312
Field of Testing: 116 - Volatile Organic Chemistry of Hazardous Waste			
116.010	000	EDB and DBCP	EPA 8011
116.020	030	Nonhalogenated Volatiles	EPA 8015B
116.020	031	Ethanol and Methanol	EPA 8015B
116.030	001	Gasoline-range Organics	EPA 8015B
116.040	041	Methyl tert-butyl Ether (MTBE)	EPA 8021B
116.040	062	BTEX	EPA 8021B
116.080	000	Volatile Organic Compounds	EPA 8260B
116.080	120	Oxygenates	EPA 8260B
116.100	001	Total Petroleum Hydrocarbons - Gasoline	LUFT GC/MS
116.100	010	BTEX and MTBE	LUFT GC/MS
116.110	001	Total Petroleum Hydrocarbons - Gasoline	LUFT
Field of Testing: 117 - Semi-volatile Organic Chemistry of Hazardous Waste			
117.010	001	Diesel-range Total Petroleum Hydrocarbons	EPA 8015B
117.016	001	Diesel-range Total Petroleum Hydrocarbons	LUFT
117.017	001	TRPH Screening	EPA 418.1
117.110	000	Extractable Organics	EPA 8270C
117.140	000	Polynuclear Aromatic Hydrocarbons	EPA 8310
117.210	000	Organochlorine Pesticides	EPA 8081A
117.220	000	PCBs	EPA 8082
117.240	000	Organophosphorus Pesticides	EPA 8141A
117.250	000	Chlorinated Herbicides	EPA 8151A
Field of Testing: 119 - Toxicity Bioassay of Hazardous Waste			
119.010	001	Fathead Minnow (P. promelas)	Polisini & Miller (CDFG 1988)
Field of Testing: 120 - Physical Properties of Hazardous Waste			

120.010	001	Ignitability	EPA 1010
120.022	001	Ignitability	EPA 1030
120.030	001	Corrosivity	EPA 1110
120.040	001	Reactive Cyanide	Section 7.3 SW-846
120.050	001	Reactive Sulfide	Section 7.3 SW-846
120.070	001	Corrosivity - pH Determination	EPA 9040B
120.080	001	Corrosivity - pH Determination	EPA 9045C
Field of Testing: 126 - Microbiology of Recreational Water			
126.010	001	Total Coliform (Enumeration)	SM9221A,B,C
126.020	001	Total Coliform (Enumeration)	SM9222A,B
126.030	001	Fecal Coliform (Enumeration)	SM9221E
126.040	001	Fecal Coliform (Enumeration)	SM9222D
126.060	001	Enterococci	SM9230C

State of California—Health and Human Services Agency
California Department of Public Health

MARK B HORTON, MD, MSPH
Director

ARNOLD SCHWARZENEGGER
Governor

January 28, 2010

EDWARD S. BEHARE, Ph.D.
ASSOCIATED LABORATORIES
806 NORTH BATAVIA
ORANGE, CA 92868

Dear EDWARD S. BEHARE, Ph.D.: Certificate No. 04232CA

This is to advise you that the laboratory named above has been accredited under National Environmental Laboratory Accreditation Program (NELAP) as an environmental testing laboratory pursuant to the provisions of the Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.

The Fields of Accreditation for which this laboratory has been accredited are enclosed. Accreditation shall remain in effect until **January 31, 2011** unless revoked by ELAP or withdrawn at your written request. To maintain accreditation, the laboratory shall comply with the National Environmental Laboratory Accreditation Conference (NELAC) Standards and all associated California Environmental Laboratory Accreditation Program Branch (ELAP) regulations and statutes.

The application for renewal of this certificate must be received before the expiration date of this certificate to remain in force according to the HSC 100845(a).

Please note that your laboratory is required to notify California ELAP of any major changes in key accreditation criteria within 30 calendar days of the change. This written notification includes, but is not limited to, changes in ownership, location, key personnel, and major instrumentation (HSC 100845(b) and (d), and NELAC Standard Section 4.3.2). The certificate must be returned to California ELAP upon loss of accredited status.

Your continued cooperation with the above requirements is essential for maintaining the high quality of the data produced by environmental laboratories accredited by the State of California.

If you have any questions, please contact Bill Walker at (213) 580-5731.

Sincerely,

George C. Kulasingam

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

Enclosure

NELAP - RECOGNIZED

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF NELAP ACCREDITATION

Is hereby granted to

ASSOCIATED LABORATORIES

806 N BATAVIA

ORANGE, CA 92868

Scope of the Certificate is limited to the
"NELAP Fields of Accreditation"
which accompany this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **04232CA**

Expiration Date: **01/31/2011**

Effective Date: **02/01/2010**

George C. Kulasingam

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

NELAP Fields of Accreditation

ASSOCIATED LABORATORIES
806 N BATAVIA
ORANGE, CA 92868
Phone: (714) 771-6900

Certificate No.: 04232CA
Renew Date: 1/31/2011

114 - Inorganic Chemistry of Hazardous Waste

114.010	001	EPA 6010B	Antimony
114.010	002	EPA 6010B	Arsenic
114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium
114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.020	001	EPA 6020	Antimony
114.020	002	EPA 6020	Arsenic
114.020	003	EPA 6020	Barium
114.020	004	EPA 6020	Beryllium
114.020	005	EPA 6020	Cadmium
114.020	006	EPA 6020	Chromium
114.020	007	EPA 6020	Cobalt
114.020	008	EPA 6020	Copper
114.020	009	EPA 6020	Lead
114.020	010	EPA 6020	Molybdenum
114.020	011	EPA 6020	Nickel
114.020	012	EPA 6020	Selenium
114.020	013	EPA 6020	Silver
114.020	014	EPA 6020	Thallium
114.020	015	EPA 6020	Vanadium
114.020	016	EPA 6020	Zinc
114.103	001	EPA 7196A	Chromium (VI)

As of 1/28/2010 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

114.106	001	EPA 7199	Chromium (VI)
114.130	001	EPA 7420	Lead
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury
114.221	001	EPA 9012A	Cyanide, Total
114.222	001	EPA 9014	Cyanide
114.230	001	EPA 9034	Sulfides, Total
114.241	001	EPA 9045C	Corrosivity - pH Determination
114.270	001	EPA 9214	Fluoride
115 - Extraction Test of Hazardous Waste			
115.020	001	EPA 1311	Toxicity Characteristic Leaching Procedure (TCLP)
115.030	001	CCR Chapter11, Article 5, Appendix II	Waste Extraction Test (WET)
116 - Volatile Organic Chemistry of Hazardous Waste			
116.030	001	EPA 8015B	Gasoline-range Organics
116.040	002	EPA 8021B	Benzene
116.040	039	EPA 8021B	Ethylbenzene
116.040	041	EPA 8021B	Methyl tert-butyl Ether (MTBE)
116.040	047	EPA 8021B	Toluene
116.040	056	EPA 8021B	Xylenes, Total
116.040	062	EPA 8021B	BTEX
116.080	000	EPA 8260B	Volatile Organic Compounds
116.080	001	EPA 8260B	Acetone
116.080	002	EPA 8260B	Acetonitrile
116.080	003	EPA 8260B	Acrolein
116.080	004	EPA 8260B	Acrylonitrile
116.080	007	EPA 8260B	Benzene
116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane

116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	034	EPA 8260B	cis-1,4-Dichloro-2-butene
116.080	035	EPA 8260B	trans-1,4-Dichloro-2-butene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	050	EPA 8260B	1,4-Dioxane
116.080	052	EPA 8260B	Ethyl Acetate
116.080	053	EPA 8260B	Ethylbenzene
116.080	055	EPA 8260B	Ethyl Methacrylate
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	058	EPA 8260B	2-Hexanone (MBK)
116.080	059	EPA 8260B	Iodomethane
116.080	062	EPA 8260B	Methacrylonitrile
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	066	EPA 8260B	Methyl Ethyl Ketone
116.080	067	EPA 8260B	Methyl Methacrylate
116.080	068	EPA 8260B	4-Methyl-2-pentanone (MIBK)
116.080	069	EPA 8260B	Naphthalene
116.080	074	EPA 8260B	Pentachloroethane
116.080	078	EPA 8260B	Propionitrile
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane

116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total
116.080	096	EPA 8260B	tert-Amyl Methyl Ether (TAME)
116.080	097	EPA 8260B	tert-Butyl Alcohol (TBA)
116.080	098	EPA 8260B	Ethyl tert-butyl Ether (ETBE)
116.080	099	EPA 8260B	Bromobenzene
116.080	100	EPA 8260B	n-Butylbenzene
116.080	101	EPA 8260B	sec-Butylbenzene
116.080	102	EPA 8260B	tert-Butylbenzene
116.080	103	EPA 8260B	2-Chlorotoluene
116.080	104	EPA 8260B	4-Chlorotoluene
116.080	105	EPA 8260B	Isopropylbenzene
116.080	106	EPA 8260B	N-propylbenzene
116.080	107	EPA 8260B	Styrene
116.080	108	EPA 8260B	1,2,4-Trimethylbenzene
116.080	109	EPA 8260B	1,3,5-Trimethylbenzene
116.080	120	EPA 8260B	Oxygenates
116.100	001	LUFT GC/MS	Total Petroleum Hydrocarbons - Gasoline
116.100	002	LUFT GC/MS	Benzene
116.100	003	LUFT GC/MS	Toluene
116.100	004	LUFT GC/MS	Xylenes
116.100	005	LUFT GC/MS	Methyl tert-butyl Ether (MTBE)
116.100	010	LUFT GC/MS	BTEX and MTBE
116.110	001	LUFT	Total Petroleum Hydrocarbons - Gasoline

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.016	001	LUFT	Diesel-range Total Petroleum Hydrocarbons
117.017	001	EPA 418.1	TRPH Screening
117.110	000	EPA 8270C	Extractable Organics
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	007	EPA 8270C	Aniline
117.110	008	EPA 8270C	Anthracene
117.110	010	EPA 8270C	Benzidine
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene

117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	bis(2-chloroethoxy)methane
117.110	021	EPA 8270C	bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	032	EPA 8270C	Chrysene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene
117.110	072	EPA 8270C	Hexachloroethane
117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	083	EPA 8270C	2-Methylnaphthalene
117.110	084	EPA 8270C	2-Methylphenol
117.110	085	EPA 8270C	3-Methylphenol

117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitroso-di-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	110	EPA 8270C	Pentachlorophenol
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol
117.110	119	EPA 8270C	Pyrene
117.110	120	EPA 8270C	Pyridine
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.140	000	EPA 8310	Polynuclear Aromatic Hydrocarbons
117.140	001	EPA 8310	Acenaphthene
117.140	002	EPA 8310	Acenaphthylene
117.140	003	EPA 8310	Anthracene
117.140	004	EPA 8310	Benz(a)anthracene
117.140	005	EPA 8310	Benzo(a)pyrene
117.140	006	EPA 8310	Benzo(b)fluoranthene
117.140	007	EPA 8310	Benzo(k)fluoranthene
117.140	008	EPA 8310	Benzo(g,h,i)perylene
117.140	009	EPA 8310	Chrysene
117.140	010	EPA 8310	Dibenz(a,h)anthracene
117.140	011	EPA 8310	Fluoranthene
117.140	012	EPA 8310	Fluorene
117.140	013	EPA 8310	Indeno(1,2,3-c,d)pyrene
117.140	014	EPA 8310	Naphthalene
117.140	015	EPA 8310	Phenanthrene
117.140	016	EPA 8310	Pyrene
117.210	000	EPA 8081A	Organochlorine Pesticides
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC

117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	000	EPA 8082	PCBs
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221
117.220	003	EPA 8082	PCB-1232
117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260
117.240	000	EPA 8141A	Organophosphorus Pesticides
117.240	002	EPA 8141A	Azinphos Methyl
117.240	005	EPA 8141A	Chlorpyrifos
117.240	007	EPA 8141A	Demeton-O
117.240	008	EPA 8141A	Demeton-S
117.240	009	EPA 8141A	Diazinon
117.240	011	EPA 8141A	Disulfoton
117.240	013	EPA 8141A	Ethion
117.240	015	EPA 8141A	Malathion
117.240	016	EPA 8141A	Mevinphos
117.240	018	EPA 8141A	Parathion Ethyl
117.240	019	EPA 8141A	Parathion Methyl
117.240	020	EPA 8141A	Phorate
117.240	022	EPA 8141A	Ronnel
117.250	001	EPA 8151A	2,4-D
117.250	002	EPA 8151A	2,4-DB
117.250	003	EPA 8151A	2,4,5-T

117.250	004	EPA 8151A	2,4,5-TP
117.250	006	EPA 8151A	Dalapon
117.250	007	EPA 8151A	Dichlorprop
117.250	008	EPA 8151A	Dinoseb
117.250	009	EPA 8151A	MCPA
117.250	010	EPA 8151A	MCPP
117.250	014	EPA 8151A	Dicamba
120 - Physical Properties of Hazardous Waste			
120.010	001	EPA 1010	Ignitability
120.022	001	EPA 1030	Ignitability
120.030	001	EPA 1110	Corrosivity
120.040	001	Section 7.3 SW-846	Reactive Cyanide
120.050	001	Section 7.3 SW-846	Reactive Sulfide
120.070	001	EPA 9040B	Corrosivity - pH Determination
120.080	001	EPA 9045C	Corrosivity - pH Determination

Appendix G

Example Chain-of-Custody Form

Date _____ Page _____ of _____

CHAIN OF CUSTODY RECORD

Assigned LR# _____

CLIENT: _____

ADDRESS _____

_____

Is this the address the final report is to be sent to? Yes ____ No ____
If "No" list mailing address in "Special Instructions" section at the bottom of this Chain of Custody.

PROJECT IDENTIFICATION/LOCATION:

PURCHASE ORDER #:

SAMPLER: (*Print AND Sign*) _____

_____

SAMPLE TURNAROUND TIME:

Requested Turnaround Time (*CIRCLE ONE*)*
Priority Charges Apply to Rush Turn Around Times
RUSH: Same Day 24 Hr 48 Hr 72 Hr
STANDARD: Standard TAT **(5 to 10 Working Days)
Other _____
* Availability of Same Day/24/48/72 Hr TAT Varies Based Upon Test Method Requirements.
**Standard TAT Varies According to Analyses.

CONTACT PERSON: _____

SAMPLED BY (*Circle One*): **Client** **Assoc. Lab Personnel**

PHONE #: ( ) _____

FAX #: ( ) _____

SAMPLE CONDITION INFO - ***FOR LAB USE ONLY:***
Samples Intact: Yes _____ No_____
Sample Seals Intact: Yes _____ No_____ N/A_____
Cooler Seals Intact: Yes _____ No_____ N/A_____

	Sample ID	Sample or Location Description	Date	Time	Matrix (See Codes Below)	# of Containers	Preservatives	Test Required

MATRIX: **GW**=Ground Water **DW**=Drinking Water **WW**=Waste Water **SW**=Storm Water **S**=Solid/Soil **A**=Air **L**=Liquid **F**=Food (*Use the codes shown here to identify the matrix above*)

Relinquished by: (Print AND Sign)***	Received By: (Print AND Sign)	Date/Time:
Relinquished by: (Print AND Sign)***	Received By: (Print AND Sign)	Date/Time:
Relinquished by: (Print AND Sign)***	Received by Lab for Analysis: (Print AND Sign)	Date/Time:

Special Instructions:

***By signing this Chain of Custody you are authorizing the analyses shown above.

_____
(Print AND Sign)

COC DISTRIBUTION:
White with report. **Yellow** to AL. **Pink** to Client's Courier.