Alameda County Water District

Section One: Introduction

Quality Assurance Program

Revision No.: New
8/26/2010

1.0 Introduction

The Alameda County Water District (ACWD) operates under a comprehensive quality assurance (QA) program designed to engage QA practices at all levels. The QA Manual describes in detail the implementation of the QA Program by outlining specific policies, organizational structure, responsibilities, and procedures.

1.1 Purpose

The primary purpose of the QA Program is to assure that all data generated are scientifically sound and legally defensible. ACWD guarantees the identity and integrity of a sample (or data) from collection through reporting of the test results.

1.2 Commitment to Excellence

ACWD personnel maintain high ethical and analytical standards which are an integral part of a credible QA Program. It is recognized at all levels of the organization that data are used to make decisions affecting water quality. Therefore, it is critical that all personnel carry out daily tasks in a manner consistent with the goals and procedures expressed in this manual and in accordance with standard operating procedures (SOPs). All personnel involved in any function affecting data quality (sample collection, analysis, testing, data reduction, calibration of instruments, and other quality assurance activities) must have sufficient training to enable them to generate and report accurate, precise, and complete data. ACWD management is committed to providing continued training regarding ethics, new technologies, and method development to support high quality analytical services.

1.3 Communications

An effective QA Program is characterized by an efficient communication system that works both up and down the organization. The Water Quality Manager, Laboratory Supervisor, and the QA Officer assure that all stakeholders are aware of quality policies, objectives, plans, and procedures. Methods for carrying out such modes of communication include:

1.3.1 Periodic section meetings to discuss mutual challenges, achievements, and concerns.

1.3.2 In-house educational programs related to quality assurance. i.e. Webinars, presentations, and hands-on training.

1.3.3 Periodic publication of memos and reports related to laboratory performance.

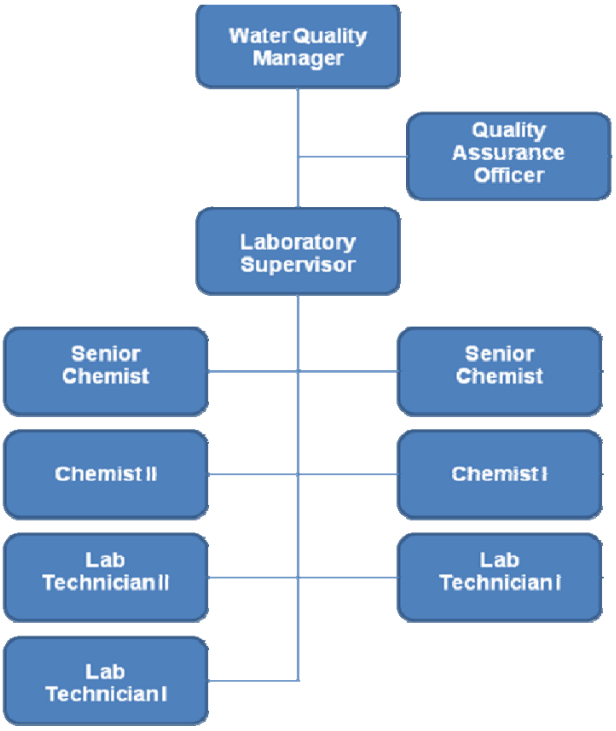
1.3.4 Use of a centralized bulletin board to monitor routine QA activities.

1.3.5 Circulation of Laboratory or QA related publications.

1.4 Organization

The QA Officer works independently from the Laboratory Supervisor to provide an unbiased check on laboratory operations to assure conformance with the QA Manual, WQL policies, and procedures. The QA Program is supported by the Operations & Maintenance Department staff members identified in Figure 1.0.

Figure 1.0



1.4.1 Water Quality Manager

The Water Quality Manager reports directly to the Operations & Maintenance Manager.

Designee(s): Environmental Engineer, Laboratory Supervisor, & Water Supply Supervisor.

Roles and Responsibility: The Water Quality Manager is ultimately responsible for the quality and performance of the division, including the WQL. This individual upholds the quality standards established, and provides the necessary leadership necessary to assure that the quality goals set forth in the QA Manual are actively pursued at all levels in the organization.

1.4.2 Laboratory Supervisor

The Laboratory Supervisor reports directly to the Water Quality Manager.
Designee(s): Senior Chemist.

Roles and Responsibility:

1.4.2.1 Manages the day-to-day operations of the WQL.
1.4.2.2 Ensures adequate staffing to meet analytical and sampling demands.
1.4.2.3 Works with staff to provide training, data review, and technical/administrative support.
1.4.2.4 Manages projects and serves as the lead project manager for WQL.
1.4.2.5 Works with staff to maintain WQL certification with ELAP.
1.4.2.6 Works with the QA Officer to address Corrective Action Requests (CARs).
1.4.2.7 Informs staff of any regulatory, operational, and project updates.
1.4.2.8 Provides an adequate budget for all QA/QC, laboratory needs.
1.4.2.9 Provides data for regulatory reporting.
1.4.2.10 Provides reporting of data to clients.
1.4.2.11 Assures lab operations support integrity of samples, and quality of data.
1.4.2.12 Facilitates the purchase and replacement of instrumentation and equipment.
1.4.2.13 Ensures all instrumentation and equipment receive timely maintenance.

1.4.3 Quality Assurance Officer

The QA Officer reports directly to the Water Quality Manager.
Designee(s): Laboratory Supervisor.

1.4.3.1 Administers, reviews, and assures conformance with the QAP.
1.4.3.2 Evaluates QA performance through internal audits and maintaining Statistical Process Control (SPC) charts.
1.4.3.3 Addresses in a timely fashion client concerns regarding analytical quality.
1.4.3.4 Trains staff on issues relating to quality assurance.
1.4.3.5 Manages QA SOPs, QA Manual, and other technical documents related to QA/QC.
1.4.3.6 Manages and reports performance test results to California Department of Health.
1.4.3.7 Prescribes and oversees the completion of CARs.
1.4.3.8 Oversees ELAP on-site inspections.
1.4.3.9 Ensures that reagents, media, and chemicals meet required specifications.
1.4.3.10 Assures appropriate calibration of instrumentation, balances, pipettes, thermometers, and field devices.
1.4.3.11 Manages all required minimum detection level (MDL) studies.

1.4.4 WQL Staff

Senior Chemists, Chemists, and Laboratory Technicians report directly to the Laboratory Supervisor. All WQL analysts are assigned to tasks as determined by the Laboratory Supervisor. Analysts are to receive training and demonstrate initial proficiency prior to conducting work independently. Analysts are to complete all QA/QC requirements that are associated with their assigned duties. QA/QC activities include but are not limited to:

1.4.4.1 Maintains and operates laboratory equipment and instrumentation.
1.4.4.2 Provides technical review for WQL guidelines & SOPs.
1.4.4.3 Reviews analytical data and performs data entry.
1.4.4.4 Prioritizes samples to be analyzed prior to expiration of hold times.
1.4.4.5 Performs sample collections and sample log-in.
1.4.4.6 Cleans glassware and restocks consumables.
1.4.4.7 Performs MDL studies as required by the method.
1.4.4.8 Maintain adequate QC documentation as required by the method.
1.4.4.9 Demonstrates analytical procedures to ELAP inspectors.
1.4.4.10 Develop SOPs with oversight from the QA Officer.
1.4.4.11 Performs routine QC checking of reagent water systems.
1.4.4.12 Performs QC on new batches of chemicals, standards, media, and sample containers.
1.4.4.13 Records temperatures on all required temperature controlled devices.
1.4.4.14 Ensures good housekeeping in analytical work areas.

1.5 Distribution & Maintenance of the QAM

The QA Officer is responsible for the preparation, issuance, review, and maintenance of the QA Manual. Controlled copies are serially numbered, and a distribution list is kept showing to whom each copy has been issued. The purpose of this control is to ensure that all changes are distributed to recipients of the QA Manual when necessary. Uncontrolled copies of the QA Manual are distributed on an as needed basis to individuals or organizations outside of ACWD. These copies will not be numbered or logged and will not receive changes as they occur. Uncontrolled copies will be marked as such. The QA Officer is responsible for annual review of the content of the QAM to ensure that the requirements reflect current operating conditions.

Alameda County Water District

Section Two: Lab Facilities

Facilities, Equipment, & Personnel Qualifications

Revision No.: New
8/26/2010

2.0 ACWD Facilities

The QA Program ensures sample and data quality at all ACWD Analytical Facilities (Table 2.0). The Water Quality Laboratory (WQL) is certified by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP), and serves as the primary analytical facility. The WQL provides analytical training, data management, method development, and administers performance test samples.

Water Treatment Plant #2 (WTP2), Blending Facility, Newark Desalination Plant, and Mission San Jose Water Treatment Plant are each outfitted with analytical capabilities to provide operational support specific to the treatment process. These analyses are conducted by Treatment Plant Operators (TPOs) and Treatment Facility Operators (TFOs) certified by the State of California. Per *40 CFR 141.28* state certified TPOs and TFOs are approved to analyze for alkalinity, calcium, conductivity, disinfectant residual, orthophosphate, pH, silica, temperature, and turbidity.

In addition, WTP2 is certified by ELAP in the Microbiology Field of Testing (FOT) for Total Coliform and E. *coli* analysis, and provides analytical support during off-peak hours.

Table 2.0: Analytical Facilities

Facility Name	Address	ELAP Cert. No.	Services	Analysts
WQL	43885 S. Grimmer Blvd, Fremont	1524	Full Service – ELAP Certified	Lab Technicians, Chemists, & Senior Chemists.
WTP2	42436 Mission Blvd., Fremont	TBD	ELAP Cert. for FOT1/WTP Operations	State Certified Treatment Plant Operators
Blending Facility	1111 Mowry Blvd., Fremont	NA	WTP Operations	State Certified Treatment Plant Operators
Newark Desalination Plant	6833 Redeker Pl., Newark	NA	WTP Operations	State Certified Treatment Plant Operators
Mission San Jose Water Treatment Plant (WTP1)	42500 Vargas Rd., Fremont	NA	WTP Operations	State Certified Treatment Plant Operators

2.1 WQL Features

The 7,200 sq. ft. WQL is designed specifically to meet all facilities requirements in the "Manual for the Certification of Laboratories Analyzing Drinking Water" US-EPA. The WQL is comprised of four sections: Sample Receiving, Organic Chemistry, Inorganic Chemistry, and Microbiology. Refer to Attachment 1 for a floor plan of the laboratory.

Each station features adequate bench space for processing samples. Appurtenances include sinks, water, gas, vacuum, fume hoods, and electrical sources free from surges. Storage areas are isolated from all potential sources of contamination. Independent heating, ventilation, and air condition system (HVAC) are operated continuously to minimize temperature variations on samples, standards, and instrumentation in the laboratory work area. The laboratory features a walk-in cooler accessible only to WQL personnel with a valid ACWD identification card. This additional level of security assures that the integrity of the samples can be maintained at all times.

2.2 WQL Capabilities

The WQL is ELAP certified and serves as the District's primary analytical facility. Attachment 2 lists the ELAP certified analyses available in-house. However additional analyses are also available through the commercial laboratory contracted by the WQL. Currently, MWH Laboratories located in Monrovia, California provides the District with additional analytical services (Refer to Attachment 3 for MWH's ELAP Certification).

The normal operating hours are Monday through Friday from 7:00am – 4:30pm. If samples are to be delivered to the WQL outside of regular operating hours please make arrangements with the Laboratory Supervisor ahead of time. It is critical that the laboratory has advanced notice regarding the number and type of samples scheduled to arrive in a given work day. This ensures that personnel can plan and complete their daily tasks in order to meet sample hold times and all QC requirements.

2.3 WQL Equipment and Instrumentation

Equipment and instruments used to generate data and are routinely monitored for performance. All instruments and equipment must be serviced per manufacturer specifications. These devices are listed in Table 2.1. All maintenance activities, significant modifications, and calibrations are recorded in a laboratory notebook.

Table 2.1 - Instrumentation & Equipment

Description	Manufacturer	Model	Purpose
Microbiology			
Incubators (2)	VWR	NA	Coliform analysis, HPC
Water Bath	Precision	NA	Coliform analysis, melted agar
Autoclave	AMSCO	3011	Sterilization of media, bottles, pipettes, waste
Colony Counter	Cenco	NA	Plate counting
Ultraviolet Light Lamp (254 nm)	UVP	UVGL-58	Coliform analysis
Ultraviolet Light Lamp (365-366 nm)	UVP	UVL-28	Coliform analysis

Stereo Microscope	Leica	GZ6	Coliform analysis, microbiological identification
Light Microscope	NA	4551	Coliform analysis, microbiological identification
Incubator Block			Block incubator: BTSure ampule incubation
Organic Chemistry			
Total Organic Carbon Analyzer	OI	1051	TOC, DOC
GC/MS	Agilent	6890 Series Plus	GC/MS
Purge & Trap	OI	4660 Eclipse	GC/MS component
Autosampler	OI	4551A	GC/MS component
Inorganic Chemistry			
Ion Chromatograph	Dionex	DX-320	Bromate, Bromide, Chlorate, Sulfate
IC Autosampler	Dionex	AS40	Accessory to DX-320
Atomic Absorption Spectrometer	Perkin Elmer	Analyst800	Metals + minerals
	Perkin Elmer	FIMS100	Hg
Water bath	Neslab	GP400	Hg digestion
Hot Block	Environmental Express	SC100	Nitric acid/Hg digestion
General Laboratory			
LIMS Server	HP	DY55NJAEA	Laboratory Information Management System
LIMS Server	Dell	PowerEdge 2950	Laboratory Information Management System
pH meter	Orion	EA940	pH
Balance	Sartorius	1401	Weighing
Balance	Mettler	AE200	Weighing
Conductivity Meter	Corning	441	Conductivity
Refrigerator/Freezer	Kenmore	~	Refrigeration of media, standards
Hot Air Oven	Thelco	130DM	Pipette sterilization.
Reagent Water System (5 units)	Barnstead	D11901	Reagent water preparation
Turbidity Meter	HACH	2100AN	turbidity measurement
UV/VIS Spectrophotometer	Milton Roy	Spectronic 601	Colorimetry - UV254
Dishwasher	Miele Professional	G7883	Dishwasher: glassware washing
Freezer	Lab-Line	3767A	Freezer for ice packs
Walk-in Fridge	Cold Room Solutions	Custom	Sample Storage.

2.4 WQL Personnel Qualifications

The ACWD WQL is staffed by qualified, experienced, and well-educated personnel. Each individual has successfully completed a competitive hiring process and meets all the requirements as listed in the District's job descriptions. Training further supports the specific needs of each staff in their role to carry out the mission of the District. Refer to Attachment 4 for a listing of resumes for key analytical staff. These staff members play a critical role in the success of the QA Program. The data generated by these WQL personnel are used to make critical decisions throughout District work units.

Alameda County Water District

Section Three: Training

Modules & Documentation

Revision No.: New
8/26/2010

3.0 Training

Training is a continuous improvement process critical in maintaining a scientifically sound and legally defensible QA Program. Training ensures that existing employees are up-to-date with skill sets and are able to perform tasks according to district procedure. Training for newly hired staff ensures that these skills and procedures are effectively communicated in a consistent manner. The QA Program requires that all staff receive training to ensure consistent analytical practices and that each individual is fully aware of laboratory safety protocols.

3.1 Training Modules

Staff will be trained according to the responsibilities assumed in their roles. Training in general consists of:

3.1.1 Orientation

This orientation is conducted by the Unit Supervisor, QA Officer or Designee(s).

3.1.1.1 Walk-through of work area to review Safety Checklist

3.1.1.2 Staff introductions

3.1.2 On-the-Job Training

This type of training addresses specific job duties and responsibilities. These modules are conducted by a variety of staff most familiar with the job at hand.

3.1.3 External Training

This type of training is used to support continuous improvement efforts. Once an individual has demonstrated the ability to perform job duties independently, then external sources for training can be used to provide further advancement in instrumentation, methodology, or industry practice.

3.1.4 Safety Training

ACWD's Safety Officer provides new staff safety training and also periodic training on work related safety topics. The Chemical Hygiene Plan is also issued to each new employee. The laboratory rotates routine safety duties such that each individual will receive safety refreshers on a periodic basis.

3.2 Training Documentation

Refer to Figure 3.0 for an example of analytical training form used to guide both trainer and trainee through the required material of a specific analysis. Document all training

and submit the completed forms to the QA Officer. The QA Officer will retain the original, and copies will be sent to the unit supervisor and trainee.

Figure 3.0: Training Documentation

ALAMEDA COUNTY WATER DISTRICT

Water Quality Analytical Training

Trainee Information	
Name:	Hours of Training:
Training Start Date:	Training End Date:

Trainer to Provide/Review Prior to Training

☐ = Required *Personal Protective Equipment* – Safety Review
☐ = *MSDS Location*
☐ = *SOP*

Analysis

Test Description: _____

Method Reference: _____

Parameters Analyzed: _____

Trainer Name & Job Title: _____

Trainer to Review:	**Notes:**
Preservation Requirements	☐ _____
Sample Hold Time	☐ _____
Sample Preparation	☐ _____
Calibration/Standardization	☐ _____
Analytical Procedure	☐ _____
Batch QC Requirements	☐ _____
Sample Disposal	☐ _____
Data Entry	☐ _____
Instrument Maintenance	☐ _____

Evaluation:

Able to Complete Analysis Independently? ☐ Yes ☐ No _____

_____ **Trainer - Date**

_____ **Trainee - Date**

Return Completed Training form to QA Officer

*QA Review*_____

Alameda County Water District

Section Four: Sample Collection

Planning, Containers, & Hold Times

Revision No.: New
8/26/2010

4.0 Sampling Procedures

Proper collection, preservation, and storage of samples are needed to ensure sample integrity and representativeness. It is critical that each sampler be trained on proper technique and also be familiar with sample preservation requirements, containers, and holding times. WQL Staff are available to train District Staff on routine sampling procedures; however specialized sampling requirements should be directed to the Laboratory Supervisor or a Senior Chemist.

4.1 Documentation & Planning

Proper documentation, including use of Field Logs and Chain-of-Custody (COC) forms are maintained throughout the sampling procedures. Field Logs are defined as any notes, observations, or field measurements that otherwise would not be documented on the COC (possibly due to space limitations). These logs should accompany the COC throughout the process and provide additional information relative to the sampling event. The COC must be properly completed in order to meet EPA requirements for tracking samples from the field. Work closely with the appropriate WQL program manager in advance to coordinate and plan the sampling event. At a minimum ensure that samplers are familiar with sample sites, and are familiar with the samples that need to be collected. It is highly recommended that COCs are pre-filled prior to collection. A pre-filled COC provides the sampler with guidance on what samples need to be collected on the day of the event.

In the case of an unplanned sample, immediately notify the laboratory with, 1) when the sample will be collected 2) the analytical procedures needed, and 3) approximate time the sample will arrive at the WQL. Blank COCs are available through the WQL. Refer to Attachment #5 – ACWD COC.

4.2 Sample Containers

Samples collected must have proper containers and preservatives. Refer to Table 4.0 for a list of sample containers and preservations for analyses.

4.3 Holding Times

Samples should be analyzed as soon as possible after collection. Analyses conducted beyond proper sample hold times are to be noted as such, and the data user informed immediately. It is highly recommended that an out of hold time sample be recollected if data are to be used for compliance or regulatory purposes. It is the goal of the WQL to meet each and every hold time. Therefore, samplers must deliver samples to the WQL in a timely fashion.

4.4 Sample Kit Request

Sample kits are requested through the Laboratory Supervisor or designated Program Managers. Discuss the details of the sampling event at least two weeks in advance such

that bottles can be ordered and prepared for the day of sampling. In general a sample kit contains: Sample bottles, protective packing, blue ice, and a COC. Once the kit has been packed the program manager or designee shall perform a review to ensure the kit is complete and that the COC reflects the sample containers provided.

Table 4.0 - WQL Analysis Information

Analyte	Method References	Max Hold Time	Preservation Requirements
pH	EPA 150.1	ASAP/Field	Store at 4°C if analyzed in lab.
Heterotrophic Plate Count	SM 9215B	Do not exceed 8hr.	Keep at 4°C, NaS_2O_3. Received < 10 deg C or < 2 hr. from collection.
Total Coliform	SM 9223	Finished Water 8hr., Do not exceed 30 hrs. Raw water do not exceed 8hr.	Keep at 4°C, NaS_2O_3. Received < 10 °C or < 2 hr. from collection.
E. Coli	SM 9223	Finished Water 8hr., Do not exceed 30 hrs. Raw water do not exceed 8hr.	Keep at 4°C, NaS_2O_3. Received < 10 °C or < 2 hr. from collection.
Total Coliform Enumeration	SM 9223	Finished Water 8hr., Do not exceed 30 hrs. Raw water do not exceed 8hr.	Keep at 4°C, NaS_2O_3. Received < 10 deg C or < 2 hr. from collection.
Sulfate	EPA 300.0	28days	Keep at 4°C
Chlorate	EPA 300.1	28days	Keep at 4°C, EDA
Bromate	EPA 300.1	28days	Keep at 4°C, EDA
Bromate	EPA 317	28days	Keep at 4°C, EDA
Bromide	EPA 300.1	28days	None.
Alkalinity	SM 2320B	14days	Keep at 4°C
Hardness	SM 2340C	180days	Keep at 4°C, pH < 2 HNO_3
Conductivity	SM 2510B	28days	Keep at 4°C
Total Dissolved Solids	SM 2540C	7days	Keep at 4°C

Chlorine, Free and Total	SM 4500-CL G	ASAP/Field	Store at 4°C if analyzed in lab.
Fluoride	SM 4500-F C	28days	Keep at 4°C
Total Organic Carbon (TOC)/Dissolved Organic Carbon (DOC).	SM 5310C	7days	Analyze immediately or pH < 2 H_2SO_4.
UV254	SM 5910B	None Specified.	Keep at 4°C
Metals: Calcium, Magnesium, Potassium, Sodium, and Zinc.	SM 3111B	180days	Keep at 4°C, pH < 2 HNO_3
Dissolved Metals: Calcium, Magnesium, Potassium, Sodium, and Zinc.	SM 3111B	180days	Filter prior to pH < 2 HNO_3, Keep at 4°C
Mercury	SM 3112B	28days	Keep at 4°C, pH < 2 HNO_3
Metals: Barium, Copper.	SM 3113B	180days	Keep at 4°C, pH < 2 HNO_3
Dissolved Metals: Barium, Copper.	SM 3113B	180days	Filter prior to pH < 2 HNO_3, Keep at 4°C
Metals: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Iron, Lead, Manganese, Nickel, Selenium, Silver, Thallium, and Vanadium.	EPA 200.9	180days	Keep at 4°C, pH < 2 HNO_3
Dissolved Metals: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Iron, Lead, Manganese, Nickel, Selenium, Silver, Thallium, and Vanadium.	EPA 200.9	180days	Filter prior to pH < 2 HNO_3, Keep at 4°C
Trihalomethanes: Bromoform, Dibromochloromethane, Bromodichloromethane, Chloroform	EPA 524.2	14days	Keep at 4°C, Sodium Thiosulfate, Zero Head Space.

Alameda County Water District

Section Five: Sample Custody

Chain of Custody (COC), Labels, & Disposal

Revision No.: New
8/26/2010

5.0 Sample Custody

All incoming samples received by District personnel undergo consistent sample receiving protocol. This ensures that all samples are evaluated for the manner in which the samples were collected and transported. This serves dual purpose;

5.0.1 Ensures that each sample meets mandatory method requirements for collection and transport prior to analysis (i.e. Sample container, preservation, and hold times.)

5.0.2 Provides the analyst with field and sample condition observations that may result in the qualification or rejection of data.

5.1 COC Procedures

"Chain of Custody is a legal term that refers to the ability to guarantee the identity and integrity of the sample (or data) from collection through reporting of the test results." -U.S. EPA

5.1.1 The COC validates the details of custody transfer of samples from the field to the laboratory. Samples are also packed in coolers, secured, and transported through the use of a third party courier. In this case, since samples have been secured into the cooler, the courier does not sign for receipt or relinquishing of samples.

5.1.2 Upon receipt at the laboratory, the Sample Control Custodian is the primary person who assumes custody of the samples. If the Sample Control Custodian is unavailable, any trained sample control personnel are to receive samples.

5.1.2.1 Upon arrival, check samples for damage or for exposure to extreme conditions. Samples that are cracked but not leaking are acceptable for analysis. Document any observable issues with sample condition on the COC.

5.1.2.2 Match each sample with the corresponding line item on the COC. Each sample received must be accounted for on the COC. Make any additions/corrections to the COC accordingly.

5.1.2.3 **Note: For Bacti Analysis Only.** Record the temperature of one representative sample with the IRT.

5.1.2.3.1 With the IRT in hand locate the "Power" button on the right side of the IRT. Refer to Figure 5.0

5.1.2.3.2 Press "Power". The display will read a temperature and "Deg C IR 0.95". Refer to Figure 5.1

Figure 5.0 Figure 5.1

5.1.2.3.3 Aim the IRT at the sample and engage the trigger. Ensure that the IR beam (seen as a red dot) is located on the sample container.

5.1.2.3.4 Record the temperature on the "Notes:" portion of the COC.

5.1.2.3.5 Check the "□ < 2 hour" box if samples arrived within 2 hrs of collection.

5.1.2.4 When transferring custody, the relinquisher must record the time and date of transfer, then sign the "Relinquished by" field. The receiver must then assume custody by signing the "received by" field, then record the date and time of sample receipt.

5.1.2.5 If the sample custodian receives a COC that is incomplete then the sample collector (if not present) will be contacted to by lab staff in order to complete the documentation process.

Possible Problems

5.1.2.5.1 COC description does not match sample received.
5.1.2.5.2 Samples were broken or cracked during transport.
5.1.2.5.3 Organic samples have not been properly filled.
5.1.2.5.4 Inappropriate preservatives used.
5.1.2.5.5 Samples past hold times.
5.1.2.5.6 Insufficient volume submitted.

5.2 Communications

5.2.1 Contact the QA/QC Officer at x6517 with any issues or concerns regarding sample condition. If the QA/QC Officer is unavailable contact the Laboratory Supervisor x6520.

5.2.2 Contact the Laboratory Supervisor at x6520 with any issues or concerns regarding recollection or cancelation of a sample. If the Laboratory Supervisor is unavailable contact the QA/QC Officer at x6517 for assistance

5.3 Sample Labels

Provide the following information on the sample label:

5.3.1 Sample ID
5.3.2 Sampler name
5.3.3 Date and time of sampling
5.3.4 Preservatives if applicable
5.3.5 Analyses required

5.4 Routing Samples

Once the log-in process has been completed the sample control staff places the sample into the secure walk-in cooler or delivers it directly to the analyst. A copy of the COC is also routed with the samples. Samples should never be transported outside of the secured laboratory area without consent of the Laboratory Supervisor. Some samples are shared between analysts. Attention must be given to maintain a representative sample from analyst to analyst.

5.5 Sample Disposal

Samples are kept for at thirty days after analyses have been completed, or when data authorization has been completed, whichever comes first.

Alameda County Water District

Section Six: Quality Control

General Lab QC & Batch QC

Revision No.: New
8/26/2010

6.0 Quality Control

The day-to-day controls used to evaluate the overall effectiveness of the QA Program are referred to as Quality Control (QC). The QA program employs control measures and various QC activities to minimize systematic and random errors. Without adequate control, errors can emerge from personnel, instrumentation, equipment, reagents, supplies, sampling, procedures, data handling, and data reporting.

WQL personnel are responsible for completing all general laboratory QC practices as assigned by the laboratory supervisor, and also those requirements listed in each analytical method. All QC activities are documented in a laboratory notebook or analytical report.

6.1 General Lab QC

General Lab QC is to be completed on a routine basis to assure that basic laboratory functions are operating within required specifications. All WQL personnel are to report any QC failures to the Laboratory Supervisor or Quality Assurance Officer immediately. Table 4.0 lists the QC activities that are required for general laboratory equipment and supplies.

6.1.1 pH Meter

6.1.1.1 Standardize pH meter before each use with pH 7.0 and either pH 4.0 or 10.0 standard buffer, whichever range covers the desired pH of the media, reagent, or sample. Record date, buffer type (i.e. pH 4.0), buffer lot #, slope, and secondary check standard results in a logbook, along with analyst's initials.

6.1.1.2 The slope should be between 95-105%. If not, follow manufacturer's instructions for electrode maintenance and general cleaning.

6.1.2 Balance

6.1.2.1 Maintenance, calibration, and cleaning are to be conducted on an annual basis. All maintenance records are on file and available upon request.

6.1.2.2 Balances are to be checked monthly using ASTM Class, 1, 2, or 3 weights. Use a minimum of three weights.

6.1.3 Temperature Monitoring Devices

6.1.3.1 Glass and electronic thermometers are to be checked and calibrated on an annual basis against a National Institute of Standards and Technology (NIST) traceable reference thermometer.

6.1.3.2 The calibration factor and date of the calibration are noted on the device. All calibration certifications are on file and available upon request.

6.1.4 Incubator Units

6.1.4.1 The calibration-corrected temperatures are to be recorded for each thermometer being used twice per day each day the incubator is in use. The acceptable tolerance ranges are 35° ± 0.5° C and 44.5° ± 0.2° C.

6.1.5 Autoclave

6.1.5.1 The date, contents, sterilization time and temperature, total time in autoclave, and analyst's initials are recorded each time the autoclave is used. Maintenance is conducted on an annual basis, and all records are on file and available upon request.

6.1.5.2 A maximum-temperature registering thermometer is used to ensure proper sterilization temperature has been reached. Spore strips or ampules are used on a monthly basis to confirm sterilization.

6.1.6 Hot Air Oven (Sterilization Purposes)

6.1.6.1 Temperature must be maintained between 170° - 180° C for at least two hours.

6.1.6.2 The date, contents, sterilization time and temperature, and analyst's initials are recorded each time the oven is used for sterilization.

6.1.6.3 Spore strips are to be used on a monthly basis to confirm sterilization.

6.1.7 Conductivity Meter

6.1.7.1 The conductivity meter is calibrated prior to each use, and a secondary check standard used to confirm calibration accuracy. The date, calibration standard manufacturer, concentration, lot#, check standard manufacturer, concentration, lot#, and analyst initials are recorded.

6.1.8 Refrigerator

6.1.8.1 Calibrated-corrected temperatures are to be recorded once per day except for days when laboratory is not staffed.

6.1.9 Micropipetters

6.1.9.1 Micropipetters are to be calibrated annually and adjusted or discarded if accuracy and precision is greater than 2.5%.

6.2 Batch Quality Control

If at all possible limit the analysis to 20 or fewer samples (with the exception of some analyses). It is up to each analyst to manage work load and meet all hold times. It is highly recommended that samples be analyzed as soon as possible.

All samples in a batch must be processed with the same method and with the same lots of reagents and standards. If a lot of titrant is expended in the middle of processing a batch of samples, the required beginning QC must be verified prior to processing the remaining samples.

When calibrations are required, all samples in a batch are quantified against the same calibration curve. It is the responsibility of the analyst to report any failed or anomalous data results. Method blanks, laboratory fortified blanks, laboratory fortified matrix, laboratory fortified matrix duplicate, calibration check standard, quality control standards, internal standards, and surrogates are all examples of required batch QC samples.

6.2.1 Method Blank

A method blank is a portion of reagent water which receives identical analytical treatment as samples, including exposure to all analytical equipment, glassware, procedures, and reagents. A method blank is required for each batch of 20 or fewer samples, and results are expected to be below the method detection limit (MDL). The method blank is run at the beginning of the analysis prior to running samples. Detection of analytes in the method blank is an indication of contamination from the analytical procedure. Possible contamination will be noted with each batch associated with a method blank result that has been reported above the MDL. However, if method blank contamination occurs more frequently as compared to historical occurrences undertake immediate corrective action and notify the QA Officer.

6.2.2 Laboratory Fortified Blanks

The laboratory fortified blank (LFB) is a method blank that has been spiked with a known concentration of the analyte(s) of interest. It is used to evaluate the ability of a method to recover the analyte in a clean matrix, and the ability of the analyst to deliver an accurate amount of spike. A LFB is required for each batch of 20 or fewer samples, and results are to be within specified control limits. Failed LFB results are commonly attributed to analyst error and should be noted as such on the work batch. LFB failures that are not attributed to analyst error may indicate contaminated spiking solutions or laboratory apparatuses. Consult with the QA Officer if the frequency of LFB failures increases.

6.2.3 Duplicates

Samples are randomly selected to be analyzed in duplicate. Samples must contain analytes of measureable concentration. If no native concentration exists in the sample a laboratory fortified matrix is analyzed in duplicate. Express the precision of the duplicate result in relative percent difference (RPD) (Refer to Section 7.2.1). Include a minimum of one duplicate analysis with each set of 20 or fewer samples. Duplicate analysis evaluates precision, or the ability of the analyst to prepare two identical samples for analysis. Intermittent failed duplicate analysis can also be attributed to a non-homogenous or stratified sample. Samples that contain levels of suspended solids or that can stratify over short periods of time can contribute to duplicate failures.

6.2.4 Laboratory Fortified Matrix/Laboratory Fortified Matrix Duplicate

The laboratory fortified matrix is a sample spiked with a known amount of the analyte of interest. It is used to evaluate the bias as influenced by a specific matrix. The laboratory fortified matrix duplicate is used to evaluate the precision as influenced by the matrix. The spiking volume should be less than 5% of the sample volume. Include a minimum of one matrix spike with each set of 20 or fewer samples. Calculate percent recovery and relative percent difference for the matrix spike and matrix spike dup respectively.

6.2.5 Calibration Check Standard

The calibration check standard (also known as the CCS) is used to evaluate the degree of drift of a calibration curve. The CCS is a duplicate of the standards used to establish the calibration curve. Include a CCS after calibration and prior to analyzing any field samples. Evaluate the acceptability of the CCS based on the established acceptance criteria. Refer to the analytical SOP for detailed specifications. For chromatographic analyses such as IC, and GC/MS the CCS is also used to evaluate elution times. Compounds must elute at the same time within the tolerable allowance. Field samples are valid only if bracketed by acceptable CCSs. If a CCS fails take immediate corrective action. If the CCS continues to fail consult with the QA Officer.

6.2.6 Quality Control Standard

The quality control standard (also known as the QCS) is used to evaluate the accuracy of the calibration established. The quality control standard is purchased from a source different from that of the calibration standards. Standards from separate lot numbers are acceptable. Include a QCS every time a new calibration curve has been established. Evaluate the percent recovery of the QCS. If the QCS fails the specification limits, recalibrate the instrument and reanalyze the QCS. Refer to the analytical SOP for specific QCS requirements.

6.2.7 Internal Standards

The internal standard is generally included in the analysis of compounds using GC, GC/MS, and ICP/MS technologies. An internal standard is an analyte added to each sample prior to analysis by the instrument. Internal standards should closely resemble the analytes of interest but not interfere with the analysis. When quantifying by the internal standard, measure all analyte responses relative with the respective internal standard, unless interference is suspected. If internal standard results do not meet acceptance criteria take immediate corrective action.

6.2.8 Surrogate

Surrogates are used in the analysis or organic compounds and evaluate the method performance in each sample. A surrogate standard is a compound of a known amount added to each sample before extraction. Surrogates should closely resemble the analytes of interest but are unlikely to be found in environmental samples. Surrogates are introduced to samples before extraction to monitor extraction efficiency and percent recovery in each sample. Refer to the analytical SOP for specific acceptance criteria. If surrogate results do not meet acceptance criteria take immediate corrective action.

Alameda County Water District

Section Seven: Data Quality Objectives

Error Analysis, Calculations, Method Detection Limit Studies (MDL), Statistical Process Control (SPC)

Revision No.: New
8/26/2010

7.0 Quality Assurance Objectives

QA Objectives are a set of standard criteria used to evaluate the acceptability of data. Data quality is measured by precision, accuracy, completeness, representativeness, comparability, completeness, and sensitivity. The focus of the QA Objectives is to identify and minimize error.

7.1 Error: Random & Systematic

Error is separated into two distinct categories: Random and Systematic. In any measurement both types of error can exist.

7.1.1 Random error is unpredictable. Examples of random error are operator misinterpretation of data, fluctuation of readings from a measurement apparatus, or contamination. The QA Program actively controls random error by ensuring that all personnel are adequately trained and can carry out procedures in a consistent manner. Overall, variation of results should not be discernable amongst trained operators.

Since contamination is usually recognized after the analysis has already taken place. The tracking and documentation of all solutions, media, and chemicals used in the analytical process is critical. The contaminant can then be immediately and effectively removed. All affected data are identified and handled accordingly.

7.1.2 Systematic error always pushes results in one direction. One major source of systematic error in the laboratory is instrument drift. This occurs when the same measurement repeated over time either increases or decreases. This is remedied by establishing a frequency for calibration. By performing a calibration, measurements are realigned to more accurately reflect the true value.

7.2 Data Review Guidelines

The following criteria are to be used by all analysts and data reviewers to evaluate the acceptability of data. All analytical work batches are to be reviewed by an individual other than the original analyst. Exceptions are to be made on a case by case basis by the QA Officer.

7.2.1 Precision

Precision is a measure of the degree of agreement amongst replicate analyses. Precision between two data results is expressed as the relative percent difference (RPD). Precision is controlled through consistent practices in analytical method, and analyst technique. Precision is affected by changes in instrumentation, analytical limitations, and sample matrix.

The RPD is calculated with results from samples analyzed in duplicate or as matrix spike (MS), and matrix spike duplicates (MSD).

$$\text{RPD} = \frac{200 \text{ X (Base Result – Duplicate Result)}}{\text{(Base Result + Duplicate Result)}}$$

7.2.2 Accuracy

Accuracy is a measure of the closeness of an observed value to the true result. Quality control samples such as Laboratory Control Standards (LCS), Calibration Check Standards (CCS), and Quality Control Standards (QCS), matrix spikes, surrogates, and internal standards are used to measure the accuracy of a given method. Accuracy is expressed as the percent recovery of a given analyte.

$$\text{Percent Recovery} = \frac{100 \text{ X (Observed Result)}}{\text{(True Result)}}$$

For MS and MSD samples, where a known concentration is spiked into a field sample the following equation is used. Native constituents in environmental samples can positively or negatively influence the percent recovery. This is referred to as “Matrix Interference”.

$$\text{Percent Recovery} = \frac{100 \text{ X (Spike Result – Base Result)}}{\text{(Spiked Amount)}}$$

7.2.3 Representativeness

Representativeness is the degree to which data accurately and precisely describe the characteristics of the given population being analyzed. Since the entire population cannot be measured, a sample is used to represent the population of interest.

Representativeness extends to aliquots taken for analysis. Samples that become stratified over time must be homogenized prior to aliquoting procedures.

7.2.4 Comparability

Comparability expresses the confidence with which data can be compared with similar data using the same analytical methodology. Comparability is often used to evaluate shifts in analytical conditions that may lead to overly biased data. Analysis of blind quality control standards can also be used to gauge comparability between identical analytical methods. Since the value is unknown to the analyst it is a true test for comparability.

7.2.5 Completeness

Completeness goals are established to measure the effectiveness of the QA Program to produce acceptable results. Completeness is measured as a percentage of valid results compared to the total number of expected results. The completeness rule of thumb used for various aspects of analytical work is 90%. Lost samples in the field, samples received outside of hold times, contamination, and instrument malfunction can result in the laboratory not meeting the completeness goal of 90%. It is the responsibility of the Quality Assurance Officer and Laboratory Supervisor to identify and address issues preventing achievement of completeness goals.

7.3 Sensitivity & Detection Limits

Sensitivity describes the ability of the analyst or the instrument to discern changes in the output or measurement of the analyte. For example, a ruler with millimeter graduations is said to be more sensitive than a yard stick. A gradual loss in sensitivity is expected for most instrumentation as internal parts and mechanical functions degrade over time. However, all analytical procedures include inherent interferences that directly affect the sensitivity of an analysis. The ability to measure a "true zero" concentration in a sample is a real challenge due to matrix effects, imperfect sampling procedures, and limitations in instrument response.

At the low end of the concentration range, the confidence of a true detection becomes indistinguishable from background noise; this region is known as the method detection limit (MDL). The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.[1] Sensitivity must be maintained at a level that can consistently yield a MDL less than the required reporting limit (RL) of a given monitoring program.

7.3.1 Conducting and Calculating a MDL Study

7.3.1.1 Fortify a blank sample at a concentration of one to five times the estimated MDL. Initial determination of the MDL is an iterative process. Several attempts may be required to obtain an MDL that meet all requirements.

7.3.1.2 Prepare seven aliquots of the sample and process through the entire analytical method (for a more representative study, up to twenty aliquots can be used).

7.3.1.3 Calculate the standard deviation (S) of the seven replicate measurements where:

[1] 40 CFR 136 Appendix B

$$s = \sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})^2}{N-1}}$$

N = Total number of samples.
X_i= Individual Results.
X-bar = Average of all samples.

7.3.1.4 Multiply the standard deviation (S) by the Student's T-value of 3.14 when n = 7. Refer to Table 7.0 for a list of Student's T-values and Table 7.1 for an example of an MDL calculation.

MDL= (S) x (Student's T-value)

Table 7.0 – Student's T-values

# of Samples	Student's T-value
7	3.14
8	3.00
9	2.90
10	2.82
11	2.76
12	2.72
13	2.68
14	2.65
15	2.62
16	2.60
17	2.58
18	2.57
19	2.55
20	2.54

Table 7.1 – Example of MDL

Analyte	Bromoform		
Method	EPA 524.2		
Run Date Start:	2/13/2008	End:	2/17/2008
Analyst	Joe Lennen		
Low Level Spike	0.5		
Units	ppm		
Replicate 1	0.42		
Replicate 2	0.31		
Replicate 3	0.38		
Replicate 4	0.32		
Replicate 5	0.31		
Replicate 6	0.31		
Replicate 7	0.4		
Replicate 8	0.36		
Count	8		
Standard Dev	0.0449		
Students T	2.9980		
MDL	0.134		
Diagnostics Per ELAP Requirements			
Spike Value > MDL?	YES		
Is MDL > 10% of Spike Value	YES		

7.3.2 MDL Guidelines

7.3.2.1 The MDL study is mandatory only if it is required by the method.

7.3.2.2 The MDL study is a onetime requirement and is conducted as described in 40 CFR 136 Appendix B.

7.3.2.3 The WQL will maintain documentation of the MDL study results. The summary of the results are to be readily accessible by all lab staff and auditing agents.

7.3.2.4 The calculated MDL must be less than the concentration of the spike used to conduct the study, and must be greater than 10% of the spiked concentration.

7.3.2.5 The MDL study must be completed every time there is a significant change in the method, the addition of new analytes, change in analyst, or a significant change in the instrument.

7.3.2.6 Historical data can be used to construct MDL studies.

7.4 Control Charts for Variables

In statistical quality control, one of the most powerful tools for the diagnosis of production problems is the Shewhart control chart for variables. In the 1920's, Dr. Walter A. Shewhart of Bell Telephone Laboratories, Inc. developed the theory of control charts as a basic method for evaluating the quality of products from manufacturing processes. These concepts are applied in the same manner to evaluate the performance of quality control samples.

In a stable analytical environment, there also exist systematic and random variations. Systematic variation is inevitable. However, this can be minimized through improvements in the analytical process. Random variation occurs due to a chance occurrence or failure in the analytical process. Random variation requires corrective actions to eliminate the problem or to minimize the opportunity for future occurrences.

7.4.1 Developing Control Charts

The basic elements of a control chart are the center line (mean), upper control limit (UCL), and lower control limit (LCL). The WQL employs a three standard deviation control limit that ensures normally distributed data are controlled to a confidence level of 99.73% about the mean. The 20 most current data results are plotted for the variable of interest. The mean, UCL, and LCL, are calculated and plotted on the same graph. Refer to Figure 7.0 – Example of Control Chart.

7.4.1.1 Mean = $(X_1 + X_2 + X_3 \ldots X_n)/n$; Where n = total number of values.

7.4.1.2 UCL = Mean + 3 x (S); where S = Standard Deviation (Refer to 3.6.1.3)

7.4.1.3 LCL = Mean – 3 x (S).

7.4.2 Guideline for Evaluating Control Charts

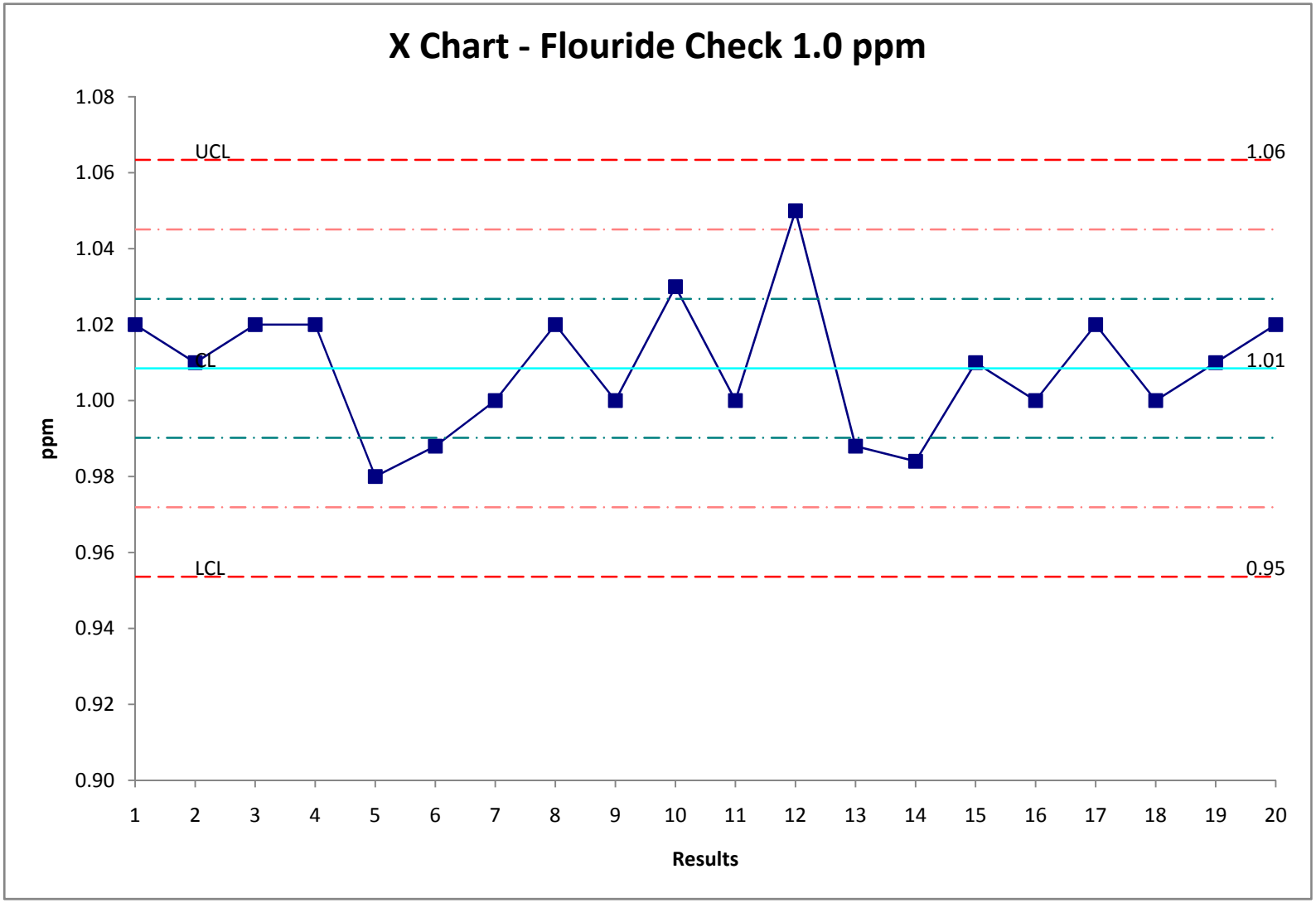
7.4.2.1 If any measurement exceeds the UCL or LCL, a random error has occurred. This indicates that the instrument or analyst may have made an error in preparing or analyzing this control standard. Once the problem is identified, action is taken to prevent future occurrences.

7.4.2.2 If four out of five successive points are in decreasing or increasing order, there may be factors affecting instrument sensitivity (or cause degradation

in the standards being used). The potential problem is identified and action is taken to reverse the trending.

7.4.2.3 If seven successive points are on the same side of the central line a systematic bias has occurred. The determination is made if these results are associated with an individual analysts or a batch of standard in use. The source(s) of biasness is identified and action is taken to eliminate it from the analytical method.

Figure 7.0 – Control Chart for Fluoride



Alameda County Water District

Section Eight: Standard Operating Procedures (SOPs)

Administration, Life cycle, General Format

Revision No.: New
8/26/2010

8.0 Scope and Application

SOPs are a written set of instructions that defines exactly what an entity does, to what standard a process should be completed, and how the success of a process can be determined. The Quality Assurance Program strives to maintain accurate SOPs that support all efforts in generating scientifically sound and legally defensible data.

8.1 Administration

The QA Program oversees the administration of SOPs. However, it is up to each work unit supervisor to determine if a SOP is needed to standardize an on-going work procedure. SOPs are organized in electronic folders made accessible to all those in the work unit. The signed original is kept with the QA Program.

8.2 Organization

It is pertinent to operations that only the production version of the SOP is referenced by all personnel. Therefore all SOPs must be managed and stored in a central location. Read-only versions are distributed for use. This ensures that all work practices are communicated in a consistent and organized fashion.

8.3 Development

SOPs are authored by any staff deemed suitable by the work unit Supervisor or QA Officer. This can be someone who is familiar with the procedure from prior experience, or has been performing the procedure as part of their routine duties. Senior staff can be tasked to develop new procedures in order to address quality or production needs. SOPS must be reviewed by a Technical Advisor, QA Officer, and Unit Supervisor. Respectively, this review process ensures SOPs are technically accurate, all QA/QC requirements are met, and resources are available to assure adherence to SOPs. The signature cover page is the final step in finalizing a SOP for production use. It must have the signatures of the Technical Reviewer, QA Officer, and Work Unit Supervisor. Administrative or QA SOPs do not require technical review.

8.3.1 Technical Advisor - A lead or senior technician or analyst. Direct experience with the methodology is NOT required, but more importantly this individual's breadth of knowledge should provide the author with feedback regarding soundness of procedure and theory.

8.3.2 QA Officer - Provides objective feedback regarding QA/QC requirements as specified by a method reference or from QA/QC industry best practices.

8.3.3 Work Unit Supervisor – Provides logistical feedback and operational support in order to ensure that the SOP as written can be met on a day-to-day basis.

8.4 Life Cycle

SOPS are working documents and have a defined life cycle. Refer to Figure 8.0 – SOP Lifecycle.

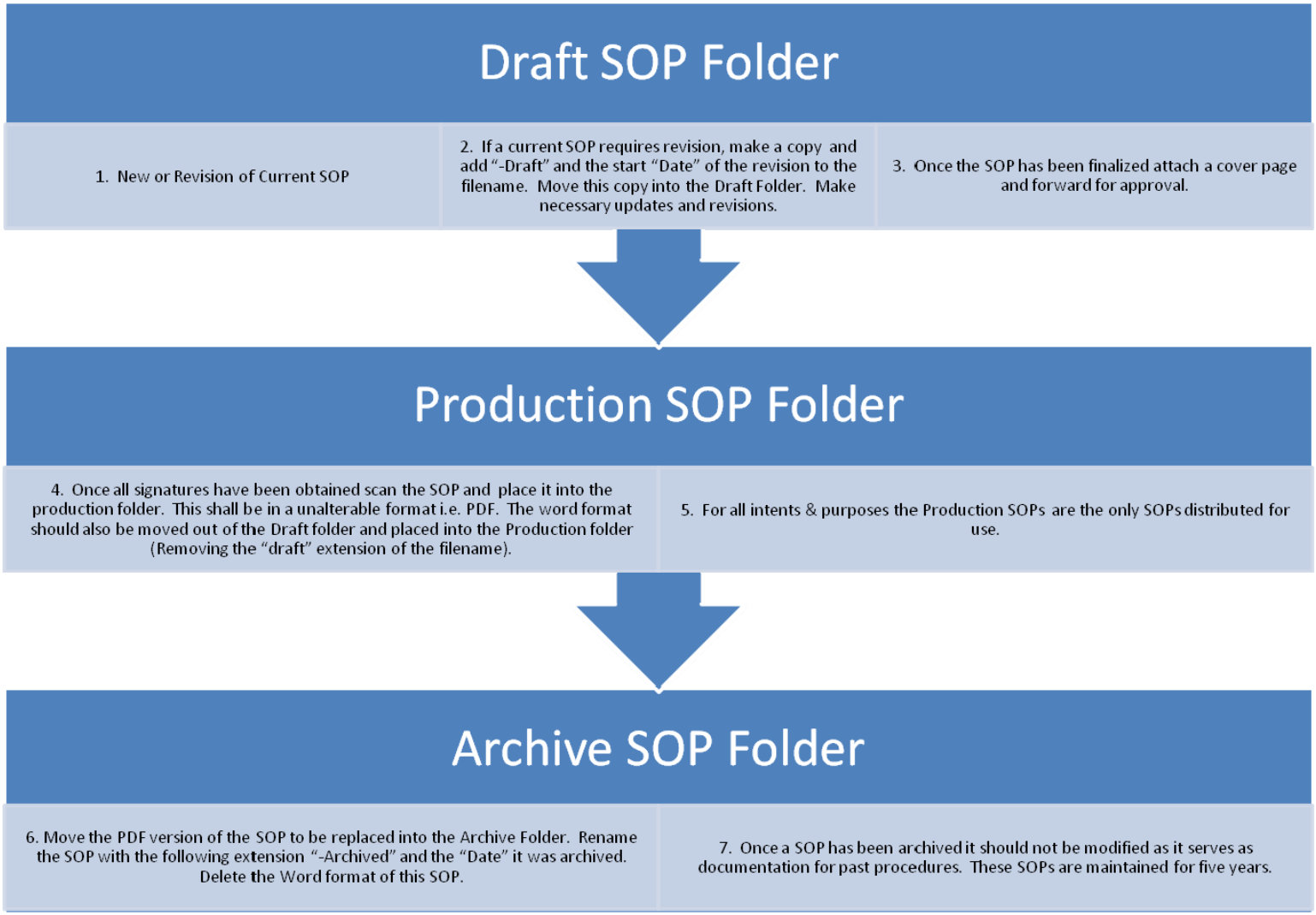
8.4.1 Draft – These SOPs are either new or current SOPs under review. If a current SOP requires revision, make a copy of that SOP and add "- Draft" and the start "Date" of editing to the filename.

Example: The SOP "Alkalinity by Potentiometric Titration", rename a copy of the file to "Alkalinity by Potentiometric Titration – Draft May 4, 2010". Move the draft copy into a separate folder designated "Draft SOPs". Make all necessary updates and revisions, and forward the Draft SOP to the Technical Reviewer, QA Officer, and Work Unit Supervisor for review. Address any edits or feedback from these individuals.

8.4.2 Production – Once all signatures have been obtained scan the cover page and SOP as separate documents. The Word format should also be moved out of the Draft Folder and placed into the Production Folder (Removing the "draft" extension of the filename.) For all intents & purposes the Production SOPs are the only SOPs distributed for use.

8.4.3 Archived –Move the SOP to be replaced into the Archive Folder. Archive both the word format and PDF format of the SOP. Rename the SOP with the following extension "-Archived" and the "Date" it was archived. Once a SOP has been archived it should not be modified as it serves as documentation for past procedures. These SOPs are maintained for five years after the archival start date.

Figure 8.0 – SOP Lifecycle



8.5 Format

The outline shown below is a guide for analytical SOPs. Other types of SOPs such as those for QA, Data Handling, Administrative, and other non-analytical SOPs do not follow a standard format.

1.0 Scope and Application
2.0 Interferences
3.0 Apparatus and Materials
4.0 Reagents and Standards
5.0 Sample Preservation and Handling
6.0 Procedure
7.0 Quality Control Requirements
8.0 Calculations
9.0 Data Handling
10.0 Forms
11.0 Waste Management
12.0 Safety
13.0 References

Alameda County Water District

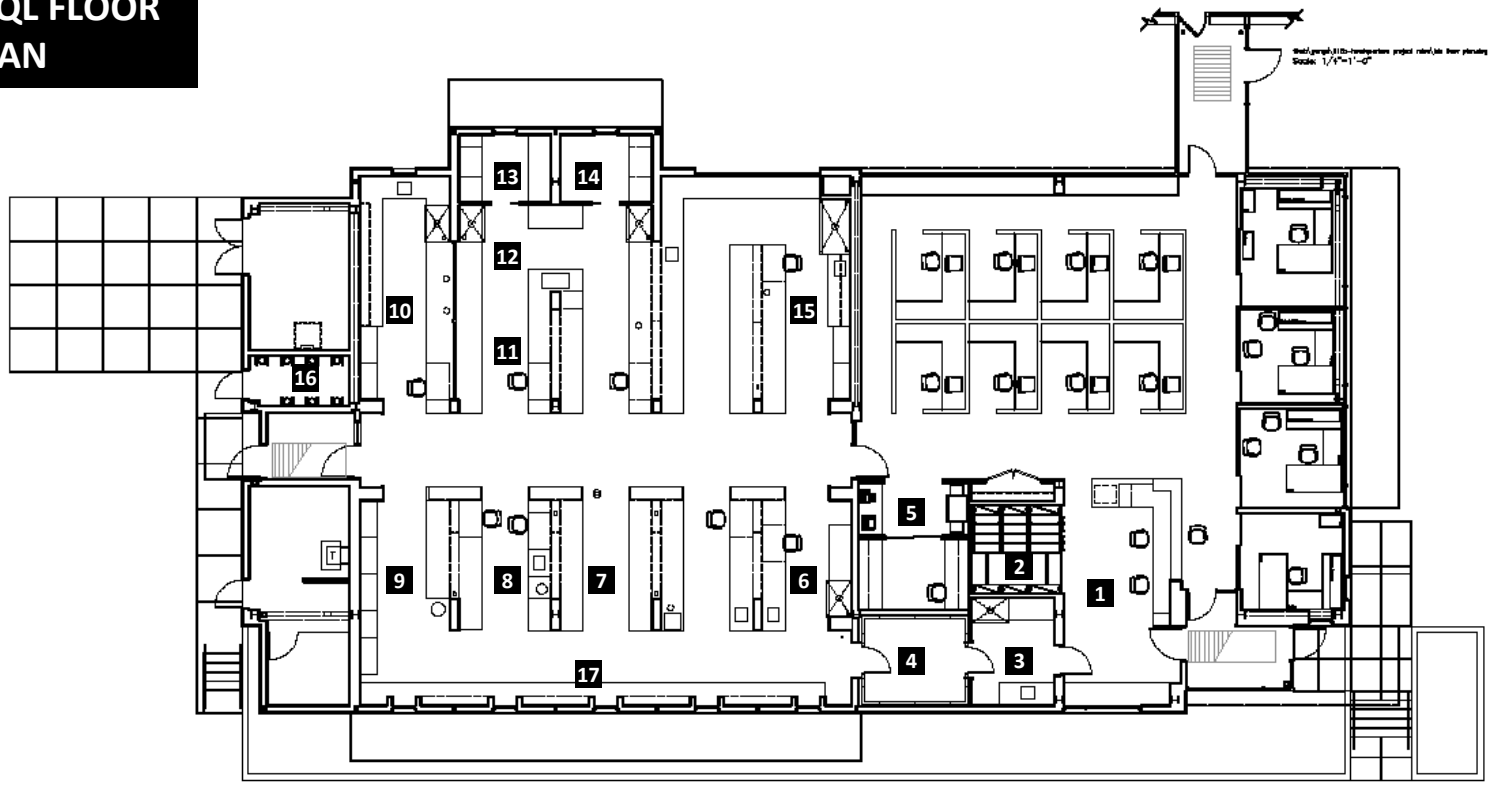
QA Manual : Attachments

#1: WQL Floor Plan, #2 ACWD ELAP Certificate, #3, MWH ELAP Certificate, #4 WQL Personnel Qualifications, #5 WQL Chain of Custody

Revision No.: New
8/26/2010

Attachment 1

WQL FLOOR PLAN



1. Sample Receiving/Customer Service
2. Record Storage
3. Sample Preparation
4. Walk-in Cold Room
5. LIMS server/Sample Label Printers
6. Standards/Reagent Preparation
7. Microbiology
8. Container Preparation
9. Container/Glassware Storage
10. Organic Chemistry
11. IC Station
12. Probes/Titrations
13. Oven Room
14. Balance Room
15. Metals Analysis
16. Gas Cylinder Room

State of California—Health and Human Services Agency

California Department of Public Health

MARK B HORTON, MD, MSPH
Director

ARNOLD SCHWARZENEGGER
Governor

April 1, 2008

JEANNETTE V. WEBER, Ph.D.
ALAMEDA COUNTY WATER DISTRICT WATER QUALITY LABORATORY
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA 94537

Dear JEANNETTE V. WEBER, Ph.D.: Certificate No 1524

Enclosed is an updated copy of your certificate.

If you have any questions, please contact our office at (510) 620-3155.

Sincerely,

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

Enclosure

Environmental Laboratory Accreditation Program Branch
850 Marina Bay Parkway, Building P, 1st Floor, MS 0511, Richmond, CA 94804
Phone (510) 620-3155, Fax (510) 620-3165
www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

ALAMEDA COUNTY WATER DISTRICT WATER QUALITY LABORATORY **Lab Phone** (510) 668-6520
OPERATIONS DEPARTMENT, WATER QUALITY/OPERATION SUPPORT
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA 94537

Certificate No: 1524 **Renew Date: 05/31/2009**

Field of Testing: 101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM9215B
101.060	002	Total Coliform	SM9223
101.060	003	E. coli	SM9223
101.160	001	Total Coliform (Enumeration)	SM9223

Field of Testing: 102 - Inorganic Chemistry of Drinking Water

102.030	010	Sulfate	EPA 300.0
102.040	001	Bromide	EPA 300.1
102.040	003	Chlorate	EPA 300.1
102.040	004	Bromate	EPA 300.1
102.100	001	Alkalinity	SM2320B
102.121	001	Hardness	SM2340C
102.130	001	Conductivity	SM2510B
102.140	001	Total Dissolved Solids	SM2540C
102.163	001	Chlorine, Free and Total	SM4500-Cl G
102.200	001	Fluoride	SM4500-F C
102.262	001	Total Organic Carbon	SM5310C
102.263	001	DOC	SM5310C
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
102.545	001	Bromate	EPA 317.0

Field of Testing: 103 - Toxic Chemical Elements of Drinking Water

103.010	010	Zinc	SM3111B
103.030	001	Mercury	SM3112B
103.040	004	Barium	SM3113B
103.040	008	Copper	SM3113B
103.150	001	Aluminum	EPA 200.9
103.150	002	Antimony	EPA 200.9
103.150	003	Arsenic	EPA 200.9
103.150	004	Beryllium	EPA 200.9
103.150	005	Cadmium	EPA 200.9
103.150	006	Chromium	EPA 200.9
103.150	008	Iron	EPA 200.9

As of 03/27/2008 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

103.150	009	Lead	EPA 200.9
103.150	010	Manganese	EPA 200.9
103.150	011	Nickel	EPA 200.9
103.150	012	Selenium	EPA 200.9
103.150	013	Silver	EPA 200.9
103.150	014	Thallium	EPA 200.9
103.150	015	Vanadium	EPA 200.9

Field of Testing: 104 - Volatile Organic Chemistry of Drinking Water

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

State of California—Health and Human Services Agency

California Department of Public Health

MARK B HORTON, MD, MSPH
Director

ARNOLD SCHWARZENEGGER
Governor

April 23, 2010

ANDREW D. EATON, Ph.D.
MWH LABORATORIES, A DIVISION OF MWH AMERICAS, INC.
750 ROYAL OAKS DRIVE, SUITE 100
MONROVIA, CA 91016

Dear ANDREW D. EATON, Ph.D.: Certificate No. 01114CA

Enclosed is an updated copy of your certificate.

If you have any questions, please contact our office at (510) 620-3155.

Sincerely,

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

Enclosure

Environmental Laboratory Accreditation Program Branch
850 Marina Bay Parkway, Building P, 1st Floor, MS 0511, Richmond, CA 94804
Phone (510) 620-3155, Fax (510) 620-3165
www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

NELAP Fields of Accreditation

MWH LABORATORIES, A DIVISION OF MWH AMERICAS, INC.

750 ROYAL OAKS DRIVE, SUITE 100
MONROVIA, CA 91016
Phone: (626) 386-1100

Certificate No.: 01114CA
Renew Date: 1/31/2011

101 - Microbiology of Drinking Water

101.010	001	SM9215B	Heterotrophic Bacteria
101.020	001	SM9221A,B	Total Coliform
101.021	001	SM9221E (MTF/EC)	Fecal Coliform
101.022	001	CFR 141.21(f)(6)(i) (MTF/EC+MUG)	E. coli
101.060	002	SM9223	Total Coliform
101.060	003	SM9223	E. coli
101.070	002	Colisure	Total Coliform
101.070	003	Colisure	E. coli
101.120	001	SM9221A,B,C	Total Coliform (Enumeration)
101.130	001	SM9221E (MTF/EC)	Fecal Coliform (Enumeration)
101.160	001	SM9223	Total Coliform (Enumeration)
101.200	001	SM9223B	E. coli (Enumeration)
101.210	001	SM9221B.1/SM9221F	E. coli (Enumeration)

102 - Inorganic Chemistry of Drinking Water

102.020	001	EPA 180.1	Turbidity
102.030	001	EPA 300.0	Bromide
102.030	002	EPA 300.0	Chlorate
102.030	003	EPA 300.0	Chloride
102.030	004	EPA 300.0	Chlorite
102.030	006	EPA 300.0	Nitrate
102.030	007	EPA 300.0	Nitrite
102.030	010	EPA 300.0	Sulfate
102.040	001	EPA 300.1	Bromide
102.040	002	EPA 300.1	Chlorite
102.040	003	EPA 300.1	Chlorate
102.040	004	EPA 300.1	Bromate
102.045	001	EPA 314.0	Perchlorate
102.047	001	EPA 331.0	Perchlorate
102.050	001	EPA 335.4	Cyanide
102.060	001	EPA 353.2	Nitrate calc.
102.061	001	EPA 353.2	Nitrite
102.070	001	EPA 365.1	Phosphate, Ortho
102.100	001	SM2320B	Alkalinity

As of 4/23/2010 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

102.110	001	SM2330B	Corrosivity (Langlier Index)
102.120	001	SM2340B	Hardness
102.130	001	SM2510B	Conductivity
102.140	001	SM2540C	Total Dissolved Solids
102.163	001	SM4500-Cl G	Chlorine, Free and Total
102.180	001	SM4500-ClO2 D	Chlorine Dioxide
102.191	001	SM4500-CN F	Cyanide, Total
102.192	001	SM4500-CN G	Cyanide, amenable
102.200	001	SM4500-F C	Fluoride
102.210	001	SM4500-H+ B	pH
102.212	001	EPA 150.1	pH
102.240	001	SM4500-P E	Phosphate, Ortho
102.262	001	SM5310C	Total Organic Carbon
102.263	001	SM5310C	DOC
102.263	002	SM5310C	TOC/DOC
102.267	001	SM5310C-OO	TOC/DOC
102.270	001	SM5540C	Surfactants
102.280	001	SM5910B	UV254
102.520	001	EPA 200.7	Calcium
102.520	002	EPA 200.7	Magnesium
102.520	003	EPA 200.7	Potassium
102.520	004	EPA 200.7	Silica
102.520	005	EPA 200.7	Sodium
102.520	006	EPA 200.7	Hardness (calc.)
102.542	001	SM4500-SiO2 C (20th)	Silica
102.545	001	EPA 317.0	Bromate
102.545	003	EPA 317.0	Chlorite
102.551	001	SM4500-Cl G (20th)	Chlorine, Free, Combined, Total
102.558	001	SM4500-Cl G-OO	Chlorine, Free, Combined, Total

103 - Toxic Chemical Elements of Drinking Water

103.130	001	EPA 200.7	Aluminum
103.130	003	EPA 200.7	Barium
103.130	004	EPA 200.7	Beryllium
103.130	005	EPA 200.7	Cadmium
103.130	007	EPA 200.7	Chromium
103.130	008	EPA 200.7	Copper
103.130	009	EPA 200.7	Iron
103.130	011	EPA 200.7	Manganese
103.130	012	EPA 200.7	Nickel
103.130	015	EPA 200.7	Silver
103.130	017	EPA 200.7	Zinc

103.140	001	EPA 200.8	Aluminum
103.140	002	EPA 200.8	Antimony
103.140	003	EPA 200.8	Arsenic
103.140	004	EPA 200.8	Barium
103.140	005	EPA 200.8	Beryllium
103.140	006	EPA 200.8	Cadmium
103.140	007	EPA 200.8	Chromium
103.140	008	EPA 200.8	Copper
103.140	009	EPA 200.8	Lead
103.140	010	EPA 200.8	Manganese
103.140	012	EPA 200.8	Nickel
103.140	013	EPA 200.8	Selenium
103.140	014	EPA 200.8	Silver
103.140	015	EPA 200.8	Thallium
103.140	016	EPA 200.8	Zinc
103.160	001	EPA 245.1	Mercury
103.301	001	EPA 100.2	Asbestos

104 - Volatile Organic Chemistry of Drinking Water

104.030	001	EPA 504.1	1,2-Dibromoethane
104.030	002	EPA 504.1	1,2-Dibromo-3-chloropropane
104.030	003	EPA 504.1	1,2,3-Trichloropropane
104.040	000	EPA 524.2	Volatile Organic Compounds
104.040	001	EPA 524.2	Benzene
104.040	002	EPA 524.2	Bromobenzene
104.040	003	EPA 524.2	Bromochloromethane
104.040	006	EPA 524.2	Bromomethane
104.040	007	EPA 524.2	n-Butylbenzene
104.040	008	EPA 524.2	sec-Butylbenzene
104.040	009	EPA 524.2	tert-Butylbenzene
104.040	010	EPA 524.2	Carbon Tetrachloride
104.040	011	EPA 524.2	Chlorobenzene
104.040	012	EPA 524.2	Chloroethane
104.040	014	EPA 524.2	Chloromethane
104.040	015	EPA 524.2	2-Chlorotoluene
104.040	016	EPA 524.2	4-Chlorotoluene
104.040	018	EPA 524.2	Dibromomethane
104.040	019	EPA 524.2	1,3-Dichlorobenzene
104.040	020	EPA 524.2	1,2-Dichlorobenzene
104.040	021	EPA 524.2	1,4-Dichlorobenzene
104.040	022	EPA 524.2	Dichlorodifluoromethane
104.040	023	EPA 524.2	1,1-Dichloroethane

104.040	024	EPA 524.2	1,2-Dichloroethane
104.040	025	EPA 524.2	1,1-Dichloroethene
104.040	026	EPA 524.2	cis-1,2-Dichloroethene
104.040	027	EPA 524.2	trans-1,2-Dichloroethene
104.040	028	EPA 524.2	Dichloromethane
104.040	029	EPA 524.2	1,2-Dichloropropane
104.040	030	EPA 524.2	1,3-Dichloropropane
104.040	031	EPA 524.2	2,2-Dichloropropane
104.040	032	EPA 524.2	1,1-Dichloropropene
104.040	033	EPA 524.2	cis-1,3-Dichloropropene
104.040	034	EPA 524.2	trans-1,3-Dichloropropene
104.040	035	EPA 524.2	Ethylbenzene
104.040	036	EPA 524.2	Hexachlorobutadiene
104.040	037	EPA 524.2	Isopropylbenzene
104.040	038	EPA 524.2	4-Isopropyltoluene
104.040	039	EPA 524.2	Naphthalene
104.040	040	EPA 524.2	Nitrobenzene
104.040	041	EPA 524.2	N-propylbenzene
104.040	042	EPA 524.2	Styrene
104.040	043	EPA 524.2	1,1,1,2-Tetrachloroethane
104.040	044	EPA 524.2	1,1,2,2-Tetrachloroethane
104.040	045	EPA 524.2	Tetrachloroethene
104.040	046	EPA 524.2	Toluene
104.040	047	EPA 524.2	1,2,3-Trichlorobenzene
104.040	048	EPA 524.2	1,2,4-Trichlorobenzene
104.040	049	EPA 524.2	1,1,1-Trichloroethane
104.040	050	EPA 524.2	1,1,2-Trichloroethane
104.040	051	EPA 524.2	Trichloroethene
104.040	052	EPA 524.2	Trichlorofluoromethane
104.040	053	EPA 524.2	1,2,3-Trichloropropane
104.040	054	EPA 524.2	1,2,4-Trimethylbenzene
104.040	055	EPA 524.2	1,3,5-Trimethylbenzene
104.040	056	EPA 524.2	Vinyl Chloride
104.040	057	EPA 524.2	Xylenes, Total
104.040	058	EPA 524.2	Hexachloroethane
104.045	001	EPA 524.2	Bromodichloromethane
104.045	002	EPA 524.2	Bromoform
104.045	003	EPA 524.2	Chloroform
104.045	004	EPA 524.2	Dibromochloromethane
104.045	005	EPA 524.2	Trihalomethanes
104.050	002	EPA 524.2	Methyl tert-butyl Ether (MTBE)

104.050	004	EPA 524.2	tert-Amyl Methyl Ether (TAME)
104.050	005	EPA 524.2	Ethyl tert-butyl Ether (ETBE)
104.050	006	EPA 524.2	Trichlorotrifluoroethane
104.050	011	EPA 524.2	Oxygenates

105 - Semi-volatile Organic Chemistry of Drinking Water

105.010	001	EPA 505	Aldrin
105.010	002	EPA 505	Alachlor
105.010	004	EPA 505	Chlordane
105.010	005	EPA 505	Dieldrin
105.010	006	EPA 505	Endrin
105.010	007	EPA 505	Heptachlor
105.010	008	EPA 505	Heptachlor Epoxide
105.010	009	EPA 505	Hexachlorobenzene
105.010	011	EPA 505	Lindane
105.010	012	EPA 505	Methoxychlor
105.010	014	EPA 505	Toxaphene
105.010	015	EPA 505	PCBs as Aroclors (screen)
105.010	016	EPA 505	PCB-1016
105.010	017	EPA 505	PCB-1221
105.010	018	EPA 505	PCB-1232
105.010	019	EPA 505	PCB-1242
105.010	020	EPA 505	PCB-1248
105.010	021	EPA 505	PCB-1254
105.010	022	EPA 505	PCB-1260
105.083	001	EPA 515.4	2,4-D
105.083	002	EPA 515.4	Dinoseb
105.083	003	EPA 515.4	Pentachlorophenol
105.083	004	EPA 515.4	Picloram
105.083	005	EPA 515.4	2,4,5-TP
105.083	006	EPA 515.4	Dalapon
105.083	007	EPA 515.4	Bentazon
105.083	008	EPA 515.4	Dicamba
105.083	009	EPA 515.4	Chlorinated Acids
105.090	001	EPA 525.2	Alachlor
105.090	002	EPA 525.2	Aldrin
105.090	003	EPA 525.2	Atrazine
105.090	004	EPA 525.2	Benzo(a)pyrene
105.090	005	EPA 525.2	Butachlor
105.090	006	EPA 525.2	Chlordane
105.090	007	EPA 525.2	Dieldrin
105.090	008	EPA 525.2	Di(2-ethylhexyl) Adipate

105.090	009	EPA 525.2	Di(2-ethylhexyl) Phthalate
105.090	010	EPA 525.2	4,4'-DDD
105.090	011	EPA 525.2	4,4'-DDE
105.090	012	EPA 525.2	4,4'-DDT
105.090	013	EPA 525.2	Endrin
105.090	014	EPA 525.2	Heptachlor
105.090	015	EPA 525.2	Heptachlor Epoxide
105.090	016	EPA 525.2	Hexachlorobenzene
105.090	017	EPA 525.2	Hexachlorocyclopentadiene
105.090	018	EPA 525.2	Lindane
105.090	019	EPA 525.2	Methoxychlor
105.090	020	EPA 525.2	Metolachlor
105.090	021	EPA 525.2	Metribuzin
105.090	022	EPA 525.2	Molinate
105.090	023	EPA 525.2	Pentachlorophenol
105.090	024	EPA 525.2	Propachlor
105.090	025	EPA 525.2	Simazine
105.090	034	EPA 525.2	Pesticides
105.101	001	EPA 531.2	Carbofuran
105.101	002	EPA 531.2	Oxamyl
105.101	003	EPA 531.2	Aldicarb
105.101	004	EPA 531.2	Aldicarb Sulfone
105.101	005	EPA 531.2	Aldicarb Sulfoxide
105.101	006	EPA 531.2	Carbaryl
105.101	007	EPA 531.2	3-Hydroxycarbofuran
105.101	008	EPA 531.2	Methomyl
105.120	001	EPA 547	Glyphosate
105.140	001	EPA 548.1	Endothall
105.150	001	EPA 549.2	Diquat
105.170	001	EPA 551.1	Bromochloroacetonitrile
105.170	005	EPA 551.1	Chloral Hydrate
105.170	007	EPA 551.1	Chloropicrin
105.170	008	EPA 551.1	Dibromoacetonitrile
105.170	010	EPA 551.1	1,2-Dibromo-3-chloropropane
105.170	011	EPA 551.1	1,2-Dibromoethane
105.170	012	EPA 551.1	Dichloroacetonitrile
105.170	013	EPA 551.1	1,1-Dichloro-2-propanone
105.170	015	EPA 551.1	Trichloroacetonitrile
105.170	018	EPA 551.1	1,1,1-Trichloro-2-propanone
105.175	001	EPA 551.1	Bromodichloromethane
105.175	002	EPA 551.1	Bromoform

105.175	003	EPA 551.1	Chloroform
105.175	004	EPA 551.1	Dibromochloromethane
105.175	005	EPA 551.1	Trihalomethanes
105.190	001	SM6251B	Bromoacetic Acid
105.190	002	SM6251B	Bromochloroacetic Acid
105.190	003	SM6251B	Chloroacetic Acid
105.190	005	SM6251B	Dibromoacetic Acid
105.190	006	SM6251B	Dichloroacetic Acid
105.190	007	SM6251B	Trichloroacetic Acid
105.190	008	SM6251B	Haloacetic Acids (HAA5)
105.201	001	EPA 552.3	Haloacetic Acids (HAA5)
105.201	002	EPA 552.3	Dalapon
105.230	001	EPA 1613	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)

106 - Radiochemistry of Drinking Water

106.010	001	EPA 900.0	Gross Alpha
106.010	002	EPA 900.0	Gross Beta
106.060	001	EPA 904.0	Radium-228
106.092	001	EPA 200.8	Uranium
106.610	001	SM7500-Rn	Radon-222

107 - Microbiology of Wastewater

107.010	001	SM9215B	Heterotrophic Bacteria
107.020	001	SM9221B	Total Coliform
107.030	001	SM9221B	Total Coliform with Chlorine Present
107.040	001	SM9221C,E (MTF/EC)	Fecal Coliform
107.050	001	SM9221E	Fecal Coliform with Chlorine Present
107.100	001	SM9230B	Fecal Streptococci
107.100	002	SM9230B	Enterococci
107.245	001	SM9223	E. coli

108 - Inorganic Chemistry of Wastewater

108.020	001	EPA 120.1	Conductivity
108.090	001	EPA 160.4	Residue, Volatile
108.110	001	EPA 180.1	Turbidity
108.112	001	EPA 200.7	Boron
108.112	002	EPA 200.7	Calcium
108.112	003	EPA 200.7	Hardness (calc.)
108.112	004	EPA 200.7	Magnesium
108.112	005	EPA 200.7	Potassium
108.112	006	EPA 200.7	Silica
108.112	007	EPA 200.7	Sodium
108.120	001	EPA 300.0	Bromide
108.120	002	EPA 300.0	Chloride

108.120	004	EPA 300.0	Nitrate
108.120	005	EPA 300.0	Nitrite
108.120	006	EPA 300.0	Nitrate-nitrite
108.120	008	EPA 300.0	Sulfate
108.183	001	EPA 335.4	Cyanide, Total
108.200	001	EPA 350.1	Ammonia
108.211	001	EPA 351.2	Kjeldahl Nitrogen
108.232	001	EPA 353.2	Nitrate-nitrite
108.260	001	EPA 365.1	Phosphate, Ortho
108.261	001	EPA 365.1	Phosphorus, Total
108.323	001	EPA 410.4	Chemical Oxygen Demand
108.360	001	EPA 420.1	Phenols, Total
108.362	001	EPA 420.4	Phenols, Total
108.385	001	SM2120B	Color
108.390	001	SM2130B	Turbidity
108.410	001	SM2320B	Alkalinity
108.420	001	SM2340B	Hardness (calc.)
108.430	001	SM2510B	Conductivity
108.440	001	SM2540B	Residue, Total
108.441	001	SM2540C	Residue, Filterable
108.442	001	SM2540D	Residue, Non-filterable
108.443	001	SM2540F	Residue, Settleable
108.465	001	SM4500-Cl G	Chlorine
108.473	001	SM4500-CN G	Cyanide, amenable
108.480	001	SM4500-F C	Fluoride
108.490	001	SM4500-H+ B	pH
108.493	001	SM4500-NH3 D or E (19th/20th)	Ammonia
108.498	001	SM4500-NH3 H (18th)	Ammonia
108.531	001	SM4500-O G	Dissolved Oxygen
108.540	001	SM4500-P E	Phosphate, Ortho
108.541	001	SM4500-P E	Phosphorus, Total
108.551	001	SM4500-SiO2 C (20th)	Silica
108.580	001	SM4500-S= D	Sulfide
108.590	001	SM5210B	Biochemical Oxygen Demand
108.591	001	SM5210B	Carbonaceous BOD
108.602	001	SM5220D	Chemical Oxygen Demand
108.611	001	SM5310C	Total Organic Carbon
108.620	001	SM5320B	Total Organic Halides
108.640	001	SM5540C	Surfactants

109 - Toxic Chemical Elements of Wastewater

109.002	001	EPA 100.2	Asbestos

As of 4/23/2010 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

109.010	001	EPA 200.7	Aluminum
109.010	002	EPA 200.7	Antimony
109.010	004	EPA 200.7	Barium
109.010	005	EPA 200.7	Beryllium
109.010	007	EPA 200.7	Cadmium
109.010	009	EPA 200.7	Chromium
109.010	010	EPA 200.7	Cobalt
109.010	011	EPA 200.7	Copper
109.010	012	EPA 200.7	Iron
109.010	013	EPA 200.7	Lead
109.010	015	EPA 200.7	Manganese
109.010	016	EPA 200.7	Molybdenum
109.010	017	EPA 200.7	Nickel
109.010	021	EPA 200.7	Silver
109.010	024	EPA 200.7	Tin
109.010	026	EPA 200.7	Vanadium
109.010	027	EPA 200.7	Zinc
109.020	001	EPA 200.8	Aluminum
109.020	002	EPA 200.8	Antimony
109.020	003	EPA 200.8	Arsenic
109.020	004	EPA 200.8	Barium
109.020	005	EPA 200.8	Beryllium
109.020	006	EPA 200.8	Cadmium
109.020	007	EPA 200.8	Chromium
109.020	008	EPA 200.8	Cobalt
109.020	009	EPA 200.8	Copper
109.020	010	EPA 200.8	Lead
109.020	011	EPA 200.8	Manganese
109.020	012	EPA 200.8	Molybdenum
109.020	013	EPA 200.8	Nickel
109.020	014	EPA 200.8	Selenium
109.020	015	EPA 200.8	Silver
109.020	016	EPA 200.8	Thallium
109.020	017	EPA 200.8	Vanadium
109.020	018	EPA 200.8	Zinc
109.020	022	EPA 200.8	Tin
109.020	023	EPA 200.8	Titanium
109.104	001	EPA 218.6	Chromium (VI)
109.190	001	EPA 245.1	Mercury
109.809	002	SM3500-Cr B (20th)	Chromium (VI)
109.812	001	SM3500-Cr C (20th)	Chromium (VI)

110 - Volatile Organic Chemistry of Wastewater

110.040	001	EPA 624	Benzene
110.040	002	EPA 624	Bromodichloromethane
110.040	003	EPA 624	Bromoform
110.040	004	EPA 624	Bromomethane
110.040	005	EPA 624	Carbon Tetrachloride
110.040	006	EPA 624	Chlorobenzene
110.040	007	EPA 624	Chloroethane
110.040	008	EPA 624	2-Chloroethyl Vinyl Ether
110.040	009	EPA 624	Chloroform
110.040	010	EPA 624	Chloromethane
110.040	011	EPA 624	Dibromochloromethane
110.040	012	EPA 624	1,2-Dichlorobenzene
110.040	013	EPA 624	1,3-Dichlorobenzene
110.040	014	EPA 624	1,4-Dichlorobenzene
110.040	015	EPA 624	1,1-Dichloroethane
110.040	016	EPA 624	1,2-Dichloroethane
110.040	017	EPA 624	1,1-Dichloroethene
110.040	018	EPA 624	trans-1,2-Dichloroethene
110.040	019	EPA 624	1,2-Dichloropropane
110.040	020	EPA 624	cis-1,3-Dichloropropene
110.040	021	EPA 624	trans-1,3-Dichloropropene
110.040	022	EPA 624	Ethylbenzene
110.040	023	EPA 624	Methylene Chloride
110.040	024	EPA 624	1,1,2,2-Tetrachloroethane
110.040	025	EPA 624	Tetrachloroethene
110.040	026	EPA 624	Toluene
110.040	027	EPA 624	1,1,1-Trichloroethane
110.040	028	EPA 624	1,1,2-Trichloroethane
110.040	029	EPA 624	Trichloroethene
110.040	030	EPA 624	Trichlorofluoromethane
110.040	031	EPA 624	Vinyl Chloride
110.040	043	EPA 624	Other Volatile Organics

111 - Semi-volatile Organic Chemistry of Wastewater

111.100	001	EPA 625	Acenaphthene
111.100	002	EPA 625	Acenaphthylene
111.100	003	EPA 625	Anthracene
111.100	004	EPA 625	Benzidine
111.100	005	EPA 625	Benz(a)anthracene
111.100	006	EPA 625	Benzo(b)fluoranthene
111.100	007	EPA 625	Benzo(k)fluoranthene

111.100	008	EPA 625	Benzo(g,h,i)perylene
111.100	009	EPA 625	Benzo(a)pyrene
111.100	010	EPA 625	Benzyl Butyl Phthalate
111.100	011	EPA 625	bis(2-chloroethoxy)methane
111.100	012	EPA 625	bis(2-chloroethyl) Ether
111.100	013	EPA 625	Bis(2-chloroisopropyl) Ether
111.100	014	EPA 625	Di(2-ethylhexyl) Phthalate
111.100	015	EPA 625	4-Bromophenyl Phenyl Ether
111.100	016	EPA 625	4-Chloro-3-methylphenol
111.100	017	EPA 625	2-Chloronaphthalene
111.100	018	EPA 625	2-Chlorophenol
111.100	019	EPA 625	4-Chlorophenyl Phenyl Ether
111.100	020	EPA 625	Chrysene
111.100	021	EPA 625	Dibenz(a,h)anthracene
111.100	022	EPA 625	1,2-Dichlorobenzene
111.100	023	EPA 625	1,3-Dichlorobenzene
111.100	024	EPA 625	1,4-Dichlorobenzene
111.100	025	EPA 625	3,3'-Dichlorobenzidine
111.100	026	EPA 625	2,4-Dichlorophenol
111.100	027	EPA 625	Diethyl Phthalate
111.100	028	EPA 625	2,4-Dimethylphenol
111.100	029	EPA 625	Dimethyl Phthalate
111.100	030	EPA 625	Di-n-butyl phthalate
111.100	031	EPA 625	Di-n-octyl phthalate
111.100	032	EPA 625	2,4-Dinitrophenol
111.100	033	EPA 625	2,4-Dinitrotoluene
111.100	034	EPA 625	2,6-Dinitrotoluene
111.100	035	EPA 625	Fluoranthene
111.100	036	EPA 625	Fluorene
111.100	037	EPA 625	Hexachlorobenzene
111.100	038	EPA 625	Hexachlorobutadiene
111.100	039	EPA 625	Hexachlorocyclopentadiene
111.100	040	EPA 625	Hexachloroethane
111.100	041	EPA 625	Indeno(1,2,3-c,d)pyrene
111.100	042	EPA 625	Isophorone
111.100	043	EPA 625	2-Methyl-4,6-dinitrophenol
111.100	044	EPA 625	Naphthalene
111.100	045	EPA 625	Nitrobenzene
111.100	046	EPA 625	2-Nitrophenol
111.100	047	EPA 625	4-Nitrophenol
111.100	048	EPA 625	N-nitrosodimethylamine

111.100	049	EPA 625	N-nitroso-di-n-propylamine
111.100	050	EPA 625	N-nitrosodiphenylamine
111.100	051	EPA 625	Pentachlorophenol
111.100	052	EPA 625	Phenanthrene
111.100	053	EPA 625	Phenol
111.100	054	EPA 625	Pyrene
111.100	055	EPA 625	1,2,4-Trichlorobenzene
111.100	056	EPA 625	2,4,6-Trichlorophenol
111.120	048	EPA 1625	N-nitrosodimethylamine

112 - Radiochemistry of Wastewater

112.010	001	EPA 900.0	Gross Alpha
112.010	002	EPA 900.0	Gross Beta

NELAP - RECOGNIZED

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF NELAP ACCREDITATION

Is hereby granted to

MWH LABORATORIES, A DIVISION OF MWH AMERICAS, INC.

750 ROYAL OAKS DRIVE, SUITE 100

MONROVIA, CA 91016

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.: **01114CA**

Expiration Date: **1/31/2011**

Effective Date: **2/1/2010**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D., Chief
Environmental Laboratory Accreditation Program Branch

ALAMEDA COUNTY WATER DISTRICT

First Name	Last Name	Current Job Title
Jeannette	Kelley	Water Quality Laboratory Supervisor

Job Title	#	Company	Brief Description of Responsibilities
Water Quality Laboratory Supervisor	3	Alameda County Water District	Supervises laboratory staff; ensures district monitoring and sampling (compliance/operational) needs are met; maintains CDPH ELAP certification for the laboratory; ensures overall quality of analytical services & reports provided by the laboratory.
Water Quality & Laboratory Manager	5	California Water Service Company	Managed Water Quality Division, Laboratory Division, & Cross Connection Control Program. Provided analytical and water quality project management support to company 70+ water systems; ensured overall quality of analytical services & reports provided by laboratory & water quality project managers. Interacted with regulators, consultants, & other company departments to assure regulatory compliance using best management practices & best available treatments.
Laboratory Supervisor (Client Services)	5	East Bay Municipal Utility District	Supervised staff providing project management & non-analytical services; ensured overall quality of analytical reports; provided training to clients on reports & sample collection.
Superintendent Water Treatment & Distribution	< 1	East Bay Municipal Utility District	Supervised staff performing system-wide inspections & water quality support programs. Directed water quality programs for the distribution system, sources, customer-driven services, & special studies.
Laboratory Supervisor (Microbiology)	4	East Bay Municipal Utility District	Supervised staff performing microbiological, biological, & toxicological analyses. Served as project manager for wastewater monitoring programs.

College	City /State	Degree	Major
Cornell University	Ithaca, NY	Bachelor of Science	Microbiology
University of California, Davis	Davis, CA	Ph.D.	Wastewater Microbiology

Organization	Member Since	Offices Held
AWWA	1991 – present	None
CWEA	1989 – present	Public Education Committee Chair, Laboratory Committee Chair
ASQ	1991 – 1997; 2007 – present	None
American Society for Microbiology	1983 – 1997; 2007 – present	None

Certificate/Training	Issuing Agency	Description
Water Quality Analyst, Grade 4	CA/NV AWWA	Certification No. 20046
Water Treatment Operator, Grade 2	CA Department Public Health	Certification No. 24693
Water Distribution Operator, Grade 2	CA Department Public Health	Certification No. 31864

Date: 11/7/2008

First Name	Last Name	Current Job Title
Calvin	Liu	QA/QC Officer

Job Title	# of Years	Company	Brief Description of Responsibilities
QA/QC Officer	1	Alameda County Water District	Perform internal audits of QC and analytical procedures. Implement QA policies in accordance with the EPA Manual for the Certification of Laboratories Analyzing Drinking Water. Maintain ELAP certification through successful annual performance testing, and on-site inspections.
QA Chemist (I,II)	2	East Bay Municipal Utilities District	Perform all method required MDL Studies. Establish in-house control limits for QC samples. Revise and develop QA SOPs. Log-in and report PT sample results.
Lab Technician (I- III)	2.5	East Bay Municipal Utilities District	Performed analysis for the purposes of Drinking Water and Wastewater monitoring in the fields of Microbiology, Organic Chemistry, Inorganic Chemistry, and Metals Digestion. Experience in analyzing majority of primary and secondary regulated chemicals by EPA approved methods.
Environmental Chemist	1	SCA Environmental	Provide on-site supervision of asbestos removal in compliance with AHERA and OSHA regulations.
Organic Chemist	<1	Signature Bioscience	Performed confirmation and purity analysis of intermediate organic chemicals in drug design process utilizing LC/MS, GC/MS, HPLC, and H-NMR.

College	City /State/Country	Degree	Major
California State University, East Bay	Hayward, CA	MBA	Operations & Materials Mgmt.
University of California , Los Angeles	Los Angeles, CA	B.S.	Chemistry

Organization	Member Since	Offices Held
ASQ – American Society for Quality	2008	None

Certificate/Training	Issuing Agency	Description
GC/MS Techniques	Varian	One week course on various GC/MS operating techniques, troubleshooting, and maintenance.
Sample Manager LIMS	Thermo	One week introduction course on Sample Manager.

Date: _____

First Name	Last Name	Current Job Title
John	Marchand	Senior Chemist

Job Title	# of years	Company	Brief Description of Responsibilities
Senior Chemist	9	ACWD	Team leader, Organic Chemical Analysis, TOC, Training and Development
Chemist 2	13	ACWD	Organic chemistry analysis, Chemical and material inventory control, QA/QC
Chemist 1	1	ACWD	Sample collection, coliform MTF MPN, titrations, ISE analysis
W.Q. Tech 2	5	ACWD	Sample collection and analysis, coliform MTF MPN, titrations
Lab Technician	3	City of Hayward	Wastewater sample collection and analysis, BOD, COD, Susp. Solids, TDS, coliform MTF MPN

College	City /State/Country	Degree	Major
CA. State Univ. Hayward	Hayward/ CA/USA	Bachelor of Science	Biology

Organization	Member Since	Offices Held
CA-Section AWWA	1988	Sm. System Committee Chair, System W.Q. Committee Chair, W.Q. Division Chair, Governing Board Trustee
Marine Science Institute	1995 - 2006	Member, Board of Strustees
Zone 7 Water Agency	1990 - 2005	Member, Board of Directors, twice served as Board President

Certificate/Training	Issuing Agency	Description
D1 Operator Certificate	CA. DPH	
40 Hour HazWoper	Network Env. Systems	

Date: _____

First Name	Last Name	Current Job Title
Yanyang	Xu	Senior Chemist

Job Title	# of	Company	Brief Description of Responsibilities
Senior Chemist	5	ACWD	
Chemist 2	7	ACWD	
Chemist 1	3	ACWD	

College	City /State/Country	Degree	Major
UMass/Amherst	Amherst/MA/USA	MS	Analytical Chemistry

Organization	Member Since	Offices Held

Certificate/Training	Issuing Agency	Description

Date: _____

First Name	Last Name	Current Job Title
Elin	Leung	Chemist II

Job Title	# of	Company	Brief Description of Responsibilities
Chemist I/II	10	ACWD	Sample Collection, Bacteriology (Total Fecal/Coliform Determination). Inorganic analysis, wet chemistry, metals analysis, and QA/QC of results. Provide customer inquiry support, oversight on client projects.
Lab Technician	2	ACWD	Sample Collection, Bacteriology (Total Fecal/Coliform Determination). Inorganic analysis, wet chemistry, metals analysis, and QA/QC of results.
Lab Assistant	0.5	ACWD	Sample Collection

College	City /State/Country	Degree	Major
San Jose State	San Jose, CA	BS	Chemistry

Organization	Member Since	Offices Held

Certificate/Training	Issuing Agency	Description
DI	AWWA	Distribution System Operator I

Date: _____

First Name	Last Name	Current Job Title
Joe	Lennen	Chemist

Job Title	# of Years	Company	Brief Description of Responsibilities
Chemist	1.5	ACWD	GCMS analysis, Sample collection, customer calls, microbiological analysis.
Acting Chemist/Senior Laboratory Technician/Laboratory Technician	13	City of Vallejo	GCMS analysis, IC analysis, TOC analysis, wet chem Analysis, microbiological analysis, customer complaints, responsible for CCR and public notification letters. Created lab budget for FY 05/06. Train operators and other lab staff. Represent COV at meetings with other water agencies.
GCMS analyst	2.5	PharmChem Laboratories	Analyze urine extracts via GCMS, liquid-liquid and solid-phase extractions.
GC Analyst	2	PharmChem Laboratories	Analyze urine extracts via GC (NPD & FID), liquid-liquid and solid-phase extractions. Prepare and read HPTLC plates for THC.
Laboratory Technician	1.5	Gallo Winery	Analyze wastewater, soil, sand and glass. Instrumentation used includes AA, UV-Vis spectrophotometer, and automatic titrator. Tests run include BOD, COD, SS, TDS, total solids.

College	City /State/Country	Degree	Major
CSU CHICO	Chico, CA USA	BA/BA	Biology/Chemistry
Modesto Junior College	Modesto, CA USA	AS	Biology

Organization	Member Since	Offices Held
AWWA	1995	None

Certificate/Training	Issuing Agency	Description

Date: ___8/28/2008_____

First Name	Last Name	Current Job Title
Jennifer	Amor	Laboratory Technician 2

Job Title	# of Years	Company	Brief Description of Responsibilities
Lab Technician 2	2	Alameda County Water District	Responsible for sample preparation, collection, and data entry in LIMS. Perform various bacteriological and chemical tests. Maintain adequate supply of reagents. Responsible for training new laboratory staff in various areas and/or duties.
Lab Assistant	3	Alameda County Water District	Responsible for sample preparation, collection, and data entry in LIMS. Performed various bacteriological and chemical tests. Maintained adequate supply of reagents.
Research Associate	1.5	Mendel Biotechnology	Responsible for all media and reagent preparation, and chemical inventory. Assisted with bacterial transformation, plant care, and various projects.

College	City /State/Country	Degree	Major
California State University, Sacramento	Sacramento, CA	B.S.	Micro/Molecular Biology

Organization	Member Since	Offices Held

Certificate	Issuing Agency	Description
FIA	Lachat Instruments	Three day training on the operation of the FIA (hardware, software, and troubleshooting).
TOC	Full Spectrum Analytics	One day training on maintenance and operation of OI 1010 Thermal-Persulfate Total Organic Carbon Analyzer

Date: _____

First Name	Last Name	Current Job Title
Nadia	Lorenson	Laboratory Technician 1

Job Title	# of	Company	Brief Description of Responsibilities
Laboratory Technician 1	2	ACWD	In addition to all Laboratory Assistant responsibilities, I am now also responsible for the following analyses: fluoride using an ion selective probe, pH, turbidity, conductivity, titrations for hardness, alkalinity, calcium, calcium hardness, and chloride.
Laboratory Assistant	1	ACWD	Routine physical, chemical, biological and bacteriological analyses of water (presence/absence detection using 18 and/or 24 hour colilert, coliform enumeration using quantitrays, membrane filtration, multiple tube fermentation, pouring and reading heterotrophic plate counts, and testing chlorine residual), using established procedures and routine laboratory instruments and equipment. Preparation of bacteriological media and standard chemical reagents.

College	City /State/Country	Degree	Major
University of California, Davis	Davis, CA	B.S.	Biological Sciences

Organization	Member Since	Offices Held

Certificate/Training	Issuing Agency	Description
Total Organic Carbon Analyzer	Full Spectrum	One day analytical training seminar for TOC Analyzer operating techniques, troubleshooting and maintenance.
Emergency Management Training	FEMA	One day training for National Incident Management System (NIMS).
Hazardous Materials Management Training	ACWD	One day training on Hazardous Materials and Waste Management.
Lachat (FIA) Training	Hach	One week training for Flow Injection Analyzer operating techniques, troubleshooting and maintenance.

Date: _____

ACWD - Water Quality Laboratory

43885 South Grimmer Boulevard

Fremont, CA 94538

Attachment 5

Chain of Custody Record

Water Quality Laboratory Info		Sampled By:
ELAP CERTIFICATE NO. 1524		
510-668-6523	Corinne Miller - Office Assistant	
510-668-6520	Jeannette Kelley - Lab Supervisor	Print First and Last Name
510-668-6517	Calvin Liu - QA/QC Officer	
510-656-3426	Fax	
Project:		Signature

WQL Use Only

LIMS Job Name(s):

SUB														
PC	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Analysis														

(PC) Preservation Code Reference

1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		14	

LIMS NUMERIC ID	Sample Location	Sample Date	Sample Time	Matrix**	# of Cont.	Sample Specific Notes & Field Data	Preservation Check *WQL USE ONLY*

** MATRIX TYPES: **RSW** = Raw Surface Water (IW, AW, OW) **CWW** = Chlorinated Waste Water **CFW** = Chlor(am)inated Finished Water **SO** = Solil

RGW = Raw Ground Water **WW** = Other Waste Water **FW** = Other Finished Water **SL** = Sludge

Attention !!! Special Instructions & Comments:

X = Sample Collected
F= Field Data
D= Data Entry Only

Relinquished by: (Print & Sign)	Company:	Date/Time:	Received by: (Print & Sign)	Company:	Date/Time:
Relinquished by: (Print & Sign)	Company:	Date/Time:	Received by: (Print & Sign)	Company:	Date/Time:
Relinquished by: (Print & Sign)	Company:	Date/Time:	Received by: (Print & Sign)	Company:	Date/Time:

Field Data Auth. / COC Reviewed by: _____ Date: _____