CRG MARINE LABORATORIES
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QUALITY ASSURANCE PROGRAM DOCUMENT

Approved by:

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2.0 INTRODUCTION

2.1 CRG Marine Laboratories, Inc., Torrance, CA (CRG) is committed to providing quality environmental analytical services to all of its clients. To maintain this high level of quality, an extensive Quality Assurance Program (QA) has been implemented within CRG. The purpose of this manual is to document the QA practices utilized by CRG. It describes the applications and concepts employed to assure that results generated by CRG are in control, scientifically valid, of known highest possible quality, and can be used with a high degree of confidence by the client or user.

2.2 CRG is certified by the California Environmental Laboratory Accreditation Program (ELAP) for the analyses of inorganics, toxic chemical elements and organics in wastewater, Certificate No. 2261.

2.3 The format of this manual is patterned after that outlined in the California Department of Health Services Application for Environmental Laboratory Accreditation.

2.4 This document is intended for use as a reference document to CRG's Quality Assurance Program. It is designed to assist all staff members to perform the operations necessary to comply with all client and contractual requirements and to ensure that data produced by CRG conforms to the highest standards set by state and/or federal regulations.

3.0 ORGANIZATIONS AND RESPONSIBILITY

3.1 CRG operates two environmental laboratories at the following locations:

2020 Del Amo Blvd, Suite 200
Torrance, CA 90501

355 Van Ness, Suite 115
Torrance, California 90501

3.2 Quality Assurance Staff Responsibilities

The Laboratory Director is ultimately responsible and accountable for all activities related to the generation of technical data by or for CRG. In order to carry out these QA responsibilities and facilitate

the integration of QA into all data generation activities, certain responsibilities have been delegated to other CRG employees.

3.2.1 The **Laboratory Director** is responsible for the following activities:

A. Provides leadership and technical direction for the organization

B. Removes barriers that limit the ability of individuals to obtain their goals and introduces change as a positive opportunity for the growth of the individual and CRG

C. Ensures that adequate QA/QC provisions are developed and incorporated into all laboratory data generation activities

D. Ensure that adequate resources are provided to meet these objectives

E. Ensure that specific QC procedures conform to the requirements specified by the client or project manager

F. Participates in appropriate certification programs and audit programs to establish credibility and demonstrate proficiency

G. Ensure that deficiencies or problems identified through audits are corrected as expeditiously as possible

H. Ensure that all routinely used analytical and administrative procedures are covered by well-written Laboratory Operating Procedures (LOP)

I. Ensure that all staff members are adequately qualified and trained to perform assigned tasks

J. Ensure that equipment is adequately maintained for the intended use

K. Ensure that the laboratory is a safe, efficient, and productive work environment.

3.2.2 The **Quality Assurance Specialist** is responsible for the following activities:

A. Maintain and update the Quality Assurance Program and this QA Manual

B. Serve as a QA liaison with clients and project managers

C. Coordinate accreditation/certification and auditing activities

D. Assess the adequacy of QC activities within the laboratory and keep the Laboratory Director informed of their effectiveness

E. Ensure that data is validated with respect to QC criteria

F. Ensure that all chain-of-custody requirements are met

G. Issue and evaluate the analyses of performance evaluation samples

H. Ensure that audit results are communicated with the appropriate staff and corrective actions are taken when needed

I. Identify and recommend staff training needs

J Work with the various laboratory staff to assure that LOPs are documented and meet the established quality standards

3.2.3 The **Organics Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art instrumental analysis techniques to cost-effectively meet CRG's requirements

B. Provide organic analytical testing services including priority pollutants and other regulated organic chemicals to CRG's clients

C. Validate data generated by the Organic Chemistry Section to assure that all quality objectives are met

D. Responsible for financial performance of the Organic Chemistry Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.4 The **Inorganics Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art instrumental analysis techniques to cost-effectively meet CRG's requirements

B. Provide inorganic analytical testing services including metals and wet chemistry to CRG's clients

C. Validate data generated by the Inorganic Chemistry Section to assure that all quality objectives are met

D. Responsible for financial performance of the Inorganic Chemistry Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.5 The **Microbiology Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art analytical techniques to cost-effectively meet CRG's requirements

B. Provide Microbiology analytical testing services including indicator bacteria, bacterial viruses and other microorganisms CRG's clients

C. Validate data generated by the Microbiology Section to assure that all quality objectives are met

D. Responsible for financial performance of the Microbiology Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.5 The **Sample Custodian** is responsible for the following activities:

A. Receipt, login, and storage of all analytical chemistry samples

B. Review all chain-of-custody forms, record sample condition, and resolve inconsistencies and problems

C. Serve as liaison between Project Managers and Analysts with respect to handling rush orders

D. Purchase, label, preserve, pack, and ship all appropriate sample containers provided to clients

E. Ensure that all laboratory samples are ultimately disposed of according to the laboratory guidelines.

4.0 QA OBJECTIVES FOR MEASUREMENT DATA

4.1 Data Quality Objectives (DQOs) for the data collection activity describe the overall level of uncertainty that a decision-maker is willing to accept in results derived from environmental analyses. The objective of CRG's Quality Assurance Program is to ensure that the validity and reliability of the data meets client's requirements in terms of DQOs. The program follows the guidelines established by the California Department of Health Services and the U.S. EPA.

Since DQOs often vary with individual projects, CRG sets internal specifications that are strict enough to meet a majority of client's requirements. Project-specific DQO's can be found in the Quality Assurance Project Plans (QAPPs) for that project.

4.2 DQOs for analytical determinations are expressed in terms of accuracy, precision, detection limits, completeness, and comparability. Section 11 of this manual describes the types of quality control checks used to measure these objectives and the procedures used to derive them. Table 1 outlines typical accuracy, precision, and method detection limit objectives for each field of

testing. Specific DQOs for each parameter are contained within the LOP used for anlaysis.

5.0 SAMPLING PROCEDURES

CRG provides trained staff for sample collection purposes. Proper sampling includes using appropriate equipment, containers, and preservation as well as following strict procedures for collection, storage, and transport to prevent cross contamination and loss of sample integrity.

CRG provides appropriate containers and sampling procedures to those clients who choose to perform their own sampling. CRG staff refers to EPA guidelines published in the Federal Register, 40 CFR Part 136.3 and Standard Methods for the Examination of Water and Wastewater, 20th Ed, for container selection and preservation.

6.0 SAMPLE CUSTODY

To produce legally defensible data, CRG maintains and demonstrates custody control of all samples. Two components of custody are addressed: physical possession and documentation.

6.1 Documentation begins with field records, including a chain-of-custody (COC) form, which follows the physical sample from the field to the laboratory. The Sample Custodian checks to insure that:

A. The sample container is clearly marked and agrees with the information provided on the chain-of-custody sheet

B. The evidence tape is unaltered and the container is intact

C. The sample was supplied in the proper type of container

D. The sample has not exceeded its maximum holding time

E. Sufficient sample volume exists to perform the requested analyses

F. Samples requiring analysis by a contract laboratory are packaged with an ice substitute and dunnage, and are shipped in an ice chest to the contract laboratory. A chain-of-custody sheet accompanies all samples shipped from CRG.

6.2 If samples are delivered without a COC, one is completed at the laboratory prior to acceptance of the samples. The Sample Custodian shall note on the COC any discrepancies between the physical sample and the custody record.

6.3 Once received, each sample is assigned a unique laboratory ID number and logged into a bound Sample Receiving Logbook. Key characteristics are recorded into the logbook, the COC is filed with the project file, and the sample is placed in the appropriate storage location until analysis.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 All instrumentation is calibrated at a frequency that ensures the validity of the results. These procedures are carried out following USEPA guidelines and the recommendations of the instrument manufacturer.

7.2 Calibration standards are prepared either from purchased stock standards or from stock standards prepared in-house utilizing reagents suitable for the preparation of standards. When available, calibration standards are prepared from starting materials that are certified traceable to the National Institute of Standards Technology (NIST).

7.3 The following is a brief summary of the instrumentation calibration procedures employed at CRG. Detailed descriptions of these procedures are contained with the appropriate method.

7.3.1 The gas chromatograph or gas chromatograph mass spectrometer is calibrated using either an external calibration procedure or internal standard. For each parameter of interest, at least three to five different concentrations of standards are employed. One of the concentrations is near the Method Detection Limit (MDL) for each parameter. Concentrations of the remaining standards correspond to the expected range of concentrations found in the samples analyzed. Calibration standards are prepared by utilizing secondary dilution standards and/or stock solutions. Calibration standards may include a set of internal standards at a known constant amount. The base peak m/z shall be used as the primary m/z for quantification of the standards. Sensitivity of the instrument is checked every 10 samples by analyzing the external reference samples. If the result is not within a predetermined range, the problem is corrected, and

the samples immediately following the last acceptable check are reanalyzed

7.3.2 The Inductively Coupled Mass Spectrometer (ICPMS) is calibrated before each use. For each parameter of interest, at least three to five different concentrations of standards are employed. One of the concentrations is near the Method Detection Limit (MDL) for each parameter. Concentrations of the remaining standards correspond to the expected range of concentrations found in the samples analyzed. Calibration standards are prepared by utilizing secondary dilution standards and/or stock solutions. Calibration standards may include a set of internal standards at a known constant amount. Sensitivity of the instrument is checked every 10 samples by analyzing the external reference samples. If the result is not within a predetermined range, the problem is corrected, and the samples immediately following the last acceptable check are reanalyzed

7.3.3 The performance of the balances is monitored against a set of calibration weights that are traceable to NIST (a log is maintained of these inspections)

7.3.4 Temperature records are maintained for all refrigerators, incubators, water baths, ovens. The temperatures are monitored at a frequency determined by how often the equipment is placed in service.

8.0 ANALYTICAL PROCEDURES

Analytical procedures are determined by current environmental regulations set forth by both state and federal guidelines. Analytical methods are published in CRG's Laboratory Operating Procedures Manual (LOPM). Revisions and updates of the LOPMs are developed as required. The LOPMs are numbered to correspond with their standard reference method.

8.1 The manual includes the methods employed by CRG for the analyses required to support CRG's clients

8.2 The format of the LOPM is patterned after those listed in the Code of Federal Regulations.

8.3 The LOPMs are prepared by senior members of the technical staff and approved by the Laboratory Director.

8.4 The LOPM is a controlled document. Each manual is assigned to an individual who has custodial responsibilities. Revised LOPMs are issued with a new revision letter. The custodian updates the manual and is responsible for replacing the previous section(s) with the revised section(s). This insures that the analyst is always working to the latest revision of test procedures and protocols. A history file is maintained of all revisions to the LOPM. A memorandum is attached to each revision in the history file summarizing the reason for the change.

8.5 Research and development projects and methods development projects are documented in bound laboratory notebooks.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

Laboratory results are communicated to CRG's clients through the analytical report delivered either electronically or by mail. This document is based on the client's laboratory order or by group of related samples.

9.1 Data reduction- Data reduction is the process by which the analyst translates raw data into a reported result that is reviewed by a second party then approved by the section supervisor before being released in the final report. Specific calculations and verification processes are summarized in the respective LOPMs.

All determinations are performed by dedicated instrumentation equipped with a microcomputer. Results are stored in a computer file, reported in a printed report and then electronically transferred to the database. A sequence logs containing the sample position, and order of analysis is kept both electronically and hardcopy. Sample results are tracked by the computer filename cross-referenced to the unique sample ID number.

9.2 Data validation - Data validation involves ensuring the correct assignment of sample labels before instrument operation, checking the performance of the instrument, verification of successful completion of all quality-control checks, and fitness of the calculations performed by the computer.

9.3 Data Management **-** Sample analytical data including ID, date and time of collection and analyses, type of requested field and laboratory analyses, and results are entered into a Laboratory Information Management System (LIMS), which is a Microsoft Access-based database system. After data entry, all results from

sample analyses and QA/QC are reviewed for accuracy and completeness and any reporting of laboratory results are based on queries from the LIMS.

9.4 Reports **-** Electronic and/or hard copy reports are provided based on client's need. The basic report includes a header containing the CRG sample ID number, date collected, date received, date processed, prepared, date analyzed, client sample information, batch ID number, replicate number, and instrument identification. Electronic data deliverables can be designed to meet any client requests and based upon queries of the LIMS database. The section supervisor prior to release to the client reviews the final report.

9.5 Records Storage - CRG archives all client final reports and instrument files in electronic format (pdf and/or Excel) for a period of 7 years following completion of project. CRG archives all laboratory records including raw data, charts, printouts and data books in hard copy format for a period of 7 years following completion of project.

10.0 INTERNAL QUALITY CONTROL CHECKS

Quality control measurements verify the integrity of the analytical results. While the goal of all quality control procedures remains constant, specific quality control procedures vary from method to method. Every analyst is responsible for a thorough understanding of the goals of each quality control measurements and the control analyses as required per method.

10.1 A batch is defined as a group of 20 or fewer samples of similar matrix, processed together under the same conditions and with the same reagents. Quality control samples are associated with each batch and are used to assess the validity of the sample analyses. Control limits can be found in Table 4.1 of this document. Each batch must include the following QC checks:

10.1.1 Method Blank- A method blank is a sample that contains no analytes of interest. For solid matrices, no matrix is used. The method blank serves to measure contamination associated with processing the sample within the laboratory.

10.1.2 Laboratory Control Material (LCM) or Certified Reference Material (CRM)- A LCM or CRM is a sample with a matrix similar to the client samples that contains analytes of interest at known or certified concentrations. It is used to determine

the accuracy of the results based on the comparison of the measured concentration with the true value. For analytes that are greater than 10 times the MDL, the acceptable percent recovery is presented in Table 4.1.

10.1.3 Duplicate Analyses- Duplicate analyses are samples that have been split and processed within a single batch. They are used to determine the precision of the results based on the percent relative difference (%RSD) between the two sets of results. Control limits for %RSD are presented in Table 4.1.

10.1.4 Matrix Spike/Matrix Spike Duplicates (MS/MSD)- MS/MSD are samples of similar matrix to the client's samples that are spiked with a known amount of analyte. Spike recovery measures the effect of interferences caused by the sample matrix and reflects the accuracy of the determination. The spike level should be at least ten times the MDL. The duplicate spike may be used to determine the precision of the analytical results similar to Section 10.1.3.

10.1.5 Tuning Check- The tuning of the mass spectrometer is checked at the beginning of each run to insure that it is providing adequate spectra.

10.1.6 Initial Calibration- Initial calibration is performed by analyzing standards of known levels of concentration. The lowest level should be less than or equal to ten times the MDL and the remaining levels should represent the entire range of expected concentrations in the samples.

10.1.7 Calibration Verification- When a calibration curve is not performed for each run, a calibration verification is performed with a standard from, preferably a second source, is used to verify that the instrument is still operating within the original calibration curve.

10.1.8 Internal Standard- An internal standard is a non-target analyte, which is added to samples and QC checks after the preparation of the sample, just prior to analysis. It is used to compensate for variations in the instrument response from one sample to the next.

10.1.9 Recovery Surrogate- A recovery surrogate is a non-target analyte or analytes that are added to the sample prior to

processing. It is used to indicate the extraction efficiency and instrument variation from sample to sample.

11.0 PERFORMANCE AND SYSTEM EVALUATIONS

CRG is dedicated to the continuous improvement of all of its operational systems. This is an essential part of everyone's job within CRG. Internal evaluations are conducted by staff from the Laboratory and are performed on a periodic basis.

11.1 CRG employs the philosophy of Continuous Measurable Improvement systems to evaluate its process performance and to identify opportunities for improvement on a continual basis. Five key elements are essential for the Continuous Measurable Improvement system to work efficiently. The first is to establish open and honest communication among all personnel. The second is to encourage decision making by delegating responsibility to the lowest appropriate levels of the work force. The third is to provide positive recognition for achievements and to strive continuously to identify and strengthen areas needing improvements. The fourth is to provide employees with the knowledge, skills, motivation, and working environment to meet their full potential and find personal satisfaction in their work. The fifth is to accept the concept of change as a positive opportunity for growth for both the individual and the organization.

11.2 With the five key elements of this philosophy in place, all levels of personnel can develop a true quantitative measurement system for assessing the status of meeting target goals in a wide variety of processes (i.e. improved accuracy, precision, training, safety, working environment, etc.). The system begins with a quantitative evaluation of the process based on a review of both historical and current capability and performance. Individual processes are selected as proposed projects based on whether they are in statistical control, predictable, and have attained target goals. CRG then prioritizes the selected projects based on frequency and magnitude of problem recurrence. Root-cause analysis is employed to establish control and eliminate the true sources of problems. Corrective actions are taken and the process is rerun to verify stability, capability and quality. If necessary, new target goals are set for the process and the system is repeated until the acceptable goal is achieved.

12.0 PREVENTIVE MAINTENANCE

12.1 Service contracts may be maintained for the major instrumentation and equipment that are no longer under warranty. The gas chromatographs, ICPMS instrumentation, ion chromatograph and balances are typical examples of equipment that might be covered by a maintenance contract. Records of maintenance are kept by the person responsible for the equipment. Specific examples of routine preventive maintenance are further discussed in the following sections:

A. Hewlett Packard 5972 Gas Chromatograph/Mass Spectrometer System

1. Every six months, replace the MSD foreline pump oil and foreline trap pellets. During the fluid exchange, replace the outlet mist filter

2. Every year, check and if necessary replace the diffusion pump fluid

3. As needed, clean the ion source of the MSD (typically every six months)

4. As needed, the glass injector sleeve and injector septum for the split-splitless injector is replaced (typically once per month)

5. As needed, the gas purifiers and filters for the carrier gas are replaced

B. Hewlett Packard 4500 ICPMS System

1. Every six months, replace the oil and foreline trap pellets for the rough pumps. During the fluid exchange, replace the outlet mist filter

2. Every year check and replace the turbo molecular pump fluid

3. Once per month, clean the sample and skimmer cones

4. Once per week, replace the peripump tubing

5. As needed, clean the ion source of the mass spectrometer

6. Every three months, clean the nebulizer

13.0 ASSESSMENT OF PRECISION AND ACCURACY

13.1 CRG utilizes several methods to monitor precision and accuracy. These are designed to determine the reproducibility of the analysis (precision) or agreement of the result to the actual value of the analyte (accuracy). CRG routinely performs analysis of blind samples. This procedure is explained in section 14. The following definitions describe the types of analyses performed to assess precision and accuracy:

A. Duplicate analyses involve performing two separate analyses of a particular parameter on the same sample. Precision is measured by the degree of agreement between the two sample results. Duplicate analyses are designed to measure the precision of a determination when the sample contains detectable amounts of the constituent

B. Laboratory control material or certified reference material are samples that have known concentrations of the target analytes. These concentrations are either based on a series of analyses or are certified by an external laboratory such as NIST. Accuracy is determined by comparing the measured amount of analyte recovered during analysis to the known value

C. Sample spikes are samples that a known amount of the analyte has been added. Accuracy is determined by the amount of the added material recovered during analysis

D. Blank spikes or water spikes are used if poor recovery from a spiked sample occurs, analysis of blank spikes is useful to determine if the poor performance is a function of the sample matrix or the analytical process. These consist of the usual sample portion of deionized water spiked with the constituent at a concentration equivalent to that of the sample spike

E. Replicate spike analyses are employed to determine the precision and accuracy of an analysis when some or all of the parameters being determined are below the detection limit. The replicate spike procedure involves analyzing the sample and two portions of the sample spiked with a measured portion of the same analyte. Relative precision of

the spikes can be determined as well as the accuracy of the analysis. Spike concentrations are sufficient to eliminate the bias that would be created by the undetectable quantity of the parameter being determined

13.2 One set of duplicate samples or spike duplicates, a LCM or CRM sample, and a method blank are analyzed with each batch of samples.

13.3 The ongoing evaluation of relative precision and accuracy performance is accomplished by the generation of control charts. Employing a minimum of 20 results, control limits are generated utilizing the mean and standard deviation of the data set. Upper and lower “warning" limits are twice the standard deviation from the mean of the set of results for accuracy charts and twice the standard deviation from the origin for precision charts. Upper and lower "out of control" limits are three times the standard deviation from the mean for accuracy charts and three times the standard deviation from the origin for precision charts. When relative precision or accuracy results suggest atypical performance, an investigation into the problem is initiated. If a sample result is outside the out-of-control limits, the sample is reanalyzed. If samples cannot be reanalyzed, the result is flagged.

14.0 CORRECTIVE ACTIONS AND TRAINING

14.1 Corrective Actions

14.1.1 Corrective action is the process of defining- root-cause, identifying and implementing corrective action plans, educating - and training to provide system-wide solutions, and verifying that the improved system is being followed. Corrective action responses are divided into three separate categories based on the time required to complete the-corrective action. An immediate corrective action occurs when a response that fully meets closure criteria can be carried out in the same time frame that the observation of the discrepancy occurs. An intermediate corrective action is one that will require a maximum of 30 days to complete the response satisfactorily. A long-term corrective action requires a time period greater than 30 days to provide a complete response. Long-term corrective actions typically involve cooperation of additional organizational elements.

14.1.2 Both intermediate and long-term corrective actions require a detailed corrective action plan showing clearly defined

milestones, task descriptions, and responsibilities. CRG's Quality Assurance Specialist must approve all intermediate and long-term corrective action plans. Closure of corrective actions require verifiable, objective evidence that the corrective action be thorough, comprehensive, and will permanently prevent the problem from reoccurring. Corrective actions result from a wide variety of situations including:

A. Inspection of the sample indicates the: samples are 1) not representative of their source, 2) deteriorated, 3) improperly labeled, 4) damaged in transport, or 5) collected in an inappropriate container. In this case, the CRG Sample Custodian or Quality Assurance Specialist will notify the sample collector of the-problem(s) and request a new sample(s) to be collected following proper sample collection and handling methods

B. Samples that are not properly preserved, stored at incorrect temperatures, or exhibit deficiencies in the chain-of-custody records are not analyzed. The CRG Sample Custodian or Quality Assurance Specialist reviews the discrepancy with appropriate personnel and new samples are collected employing correct methods

C. The required LOPM has not been followed correctly. The supervisor reviews the Method with the analyst and requests the analyst to rerun the analysis, per the method, under the supervisor's direct observation. The analyst repeats the procedure until it is correctly performed. The analyst's performance of the method's protocol and results are evaluated randomly over a minimum of a two week period to ensure adherence to all requirements of the method

D. Instrumentation malfunctions are immediately noted in the instrument logbook and the supervisor is notified. Senior technical staff with specific in-depth knowledge of the particular instrument reviews the problem and attempt to fix the instrument. Major problems may require trained field service personnel from the manufacturer to be brought in to fix the problem. If the projected downtime will extend beyond the samples required holding time, the sample will be

either analyzed on another instrument or sent to an approved contract laboratory for analysis

E. When duplicate results, spike recovery results, or Quality Assurance reference samples are outside their acceptance limits, the supervisor is notified and the complete analytical procedure is reviewed with the analyst. The data entry and calculations are reviewed for transcription errors. Reagents and standards are checked to see if they were properly prepared and whether they are within their shelf life. The equipment is examined for proper performance. The calibration and maintenance record is reviewed to ensure the instrumentation is performing optimally. The methodology is reviewed to make sure that it is properly applied. Sampling and sample handling protocols are verified to ensure that the sample was collected properly and the recommended preservation and holding times were observed. If the cause of the problem is found, the Quality Assurance Specialist sends a Quality Assurance reference sample to the analyst for analysis. If the Quality Assurance check sample is acceptable, the duplicate or spike analysis is reanalyzed. However, if the same result is obtained in the repeat analysis, the problem is probably due to matrix interference effect. The results of the sample batch are reported with an accompanying explanation of possible matrix interference. If the precision of duplicate spike analyses improves and are in control, the sample batch run with the initial duplicate spike analysis sample is reanalyzed. A different scenario must be followed in circumstances such as insufficient sample or analysis of the sample after the prescribed holding time exists. In these situations, the original result is reported and accompanied by a failure report stating the circumstances that occurred in the initial and repeat analysis. If the results for the Quality Assurance reference sample are not satisfactory, a team will be formed to identify and correct the problem. The analysis will not be resumed until the system is in control

F. CRG's internal evaluation and corrective action program and external agency audits can result in corrective actions. The response to these evaluation studies requires a written corrective action plan that

has been accepted by the Quality Assurance Specialist. Closure requires objective evidence that the corrective action be thorough, complete, and will permanently solve the problem

G. CRG's Continuous Measurable Improvement program is designed to identify opportunities for improvements systematically. This program leads to specific corrective actions initiated by either a combination of senior technical staff and analysts or a team established to address the specific problem. A quantitative measurement is applied to ensure that the corrective action has had a positive impact on eliminating the problem.

14.2 Training

14.2.1 Educational background- the minimum qualification for conducting analyses in the laboratory is two years of college-level course work in science and two years of related analytical work experience or an equivalent combination of education and experience. These education and experience requirements provide the analysts with a proper background in the fundamentals of chemistry to assist in understanding the principles behind work that they perform.

14.2.2 Orientation- CRG provides a general orientation to working in an environmental chemistry laboratory. CRG also provides a basic safety orientation, which includes lab coats, specific safety instructions, approved footwear, location of first aid supplies, location of eyewash stations, location of emergency showers, and location of fire extinguishers.

14.2.3 Ongoing Training- CRG maintains a technical library of key journals and books for staff's use. Staffs are encouraged to join professional societies, attend conferences, and receive additional training in their technical fields.

14.2.4 Discrete Job Training- CRG Provides:

A. On-the-job training to new analysts or analysts assuming additional responsibilities.

B. Maintains a file for each employee which contains all information relating to the analysts education and training including:

Resume
Certificates from training classes and courses
Completed Training Documentation Forms
Related data

C. The following approach is used for providing staff on-the-job training:

1. Read the appropriate Laboratory Operating Procedures Method which details the analytical procedure

2. Review the associated material safety data sheets if you are not knowledgeable of the

safety hazards of the reagents used in the analysis

3. Observe the procedure in use by an analyst who is approved for performing this analysis

4. Perform the analysis under the direct supervision of a qualified analyst who will certify the successful completion of training

5. Demonstrate proficiency using the method by analyzing blind check samples

6. Document the successful completion of your training using the following Training Documentation Form:

CRG Marine Laboratories, Inc.
2020 Del Amo Boulevard, Suite 2020
Torrance, California 90501-1206

TRAINING DOCUMENTATION FORM

EMPLOYEE NAME _____

METHOD NUMBER	DATE COMPLETED	CERTIFIED BY
COMMENTS:		

15.0 QA REPORTS

Numerical results of quality control analyses are delivered as part of the analytical report package. Reports that discuss corrective actions, Quality accomplishments, control charts, and ad-hoc inquiries are generated internally on a regular basis and made available to clients upon request.

Table 1. Metals, Organic Chemistry and Inorganic Chemistry

EPA ANALYSIS METHOD	PRECISION (% RSD)	ACCURACY (% Recovery)	MDL	
200.8 TOTAL & DISSOLVED METALS BY ICPMS- LIQUID MATRIX				
Aluminum (Al)	0-30	50 - 140%	5	µg/L
Antimony (Sb)	0-30	65 - 135%	0.1	µg/L
Arsenic (As)	0-30	70 - 130%	0.2	µg/L
Barium (Ba)	0-30	70 - 130%	0.2	µg/L
Beryllium (Be)	0-30	60 - 130%	0.2	µg/L
Bismuth (Bi)	0-30	70 - 130%	5	µg/L
Cadmium (Cd)	0-30	75 - 130%	0.2	µg/L
Chromium (Cr)	0-30	70 - 130%	0.1	µg/L
Cobalt (Co)	0-30	70 - 130%	0.1	µg/L
Copper (Cu)	0-30	70 - 130%	0.4	µg/L
Iron (Fe)	0-30	55 - 140%	5	µg/L
Lead (Pb)	0-30	65 - 135%	0.05	µg/L
Lithium (Li)	0-30	75 - 125%	0.1	µg/L
Manganese (Mn)	0-30	70 - 130%	0.2	µg/L
Mercury (Hg) (245.7)	0-30	60 - 140%	0.01	µg/L
Methylmercury	0-30	75 - 125%	0.05	µg/L
Molybdenum (Mo)	0-30	70 - 130%	0.2	µg/L
Nickel (Ni)	0-30	70 - 130%	0.2	µg/L
Selenium (Se)	0-30	60 - 150%	0.2	µg/L
SEM	0-30	70 - 130%		
Silicon (Si)	0-30	70 - 130%	1	µg/L
Silver (Ag)	0-30	50 - 155%	0.5	µg/L
Strontium (Sr)	0-30	70 - 130%	0.1	µg/L
Thallium (Tl)	0-30	70 - 130%	0.1	µg/L
Tin (Sn)	0-30	65 - 140%	0.1	µg/L
Titanium (Ti)	0-30	70 - 130%	0.2	µg/L
Lanthanum (La)	0-30	75 - 125%		
Vanadium (V)	0-30	70 - 130%	0.2	µg/L
Zinc (Zn)	0-30	50 - 150%	0.1	ng/L
Boron (B)	0-30	70 - 130%	1	µg/L
Calcium (Ca)	0-30	70 - 130%	0.05	mg/L
Magnesium (Mg)	0-30	75 - 125%	0.05	mg/L
Sodium (Na)	0-30	70 - 130%	5	mg/L
Potassium (K)	0-30	70 - 130%	5	mg/L
1640 TOTAL & DISSOLVED METALS BY ICPMS- LIQUID MATRIX				
Aluminum (Al)	0-30	35 - 150%	3	µg/L
Antimony (Sb)	0-30	40 - 105%	0.01	µg/L
Arsenic (As)	0-30	65 - 125%	0.01	µg/L
Barium (Ba)	0-30	70 - 130%	0.5	µg/L
Beryllium (Be)	0-30	50 - 110%	0.005	µg/L
Bismuth (Bi)	0-30	70 - 130%	1	µg/L
Cadmium (Cd)	0-30	60 - 120%	0.005	µg/L
Chromium (Cr)	0-30	70 - 130%	0.025	µg/L

Cobalt (Co)	0-30	65 - 120%	0.005	µg/L
Copper (Cu)	0-30	55 - 120%	0.01	µg/L
Iron (Fe)	0-30	30 - 110%	0.5	µg/L
Lead (Pb)	0-30	50 - 120%	0.005	µg/L
Lithium (Li)	0-30	70 - 130%	0.01	µg/L
Manganese (Mn)	0-30	50 - 120%	0.01	µg/L
Mercury (Hg) (245.7)	0-30	70 - 130%	0.01	µg/L
Molybdenum (Mo)	0-30	55 - 135%	0.005	µg/L
Nickel (Ni)	0-30	50 - 120%	0.005	µg/L
Selenium (Se)	0-30	50 - 110%	0.01	µg/L
Silicon (Si)	0-30	70 - 130%	0.5	µg/L
Silver (Ag)	0-30	50 - 125%	0.02	µg/L
Strontium (Sr)	0-30	70 - 130%	0.01	mg/L
Thallium (Tl)	0-30	50 - 120%	0.005	µg/L
Tin (Sn)	0-30	50 - 125%	0.005	µg/L
Titanium (Ti)	0-30	70 - 130%	0.035	µg/L
Lanthanum (La)	0-30	60 - 120%	1	µg/L
Vanadium (V)	0-30	70 - 130%	0.02	µg/L
Zinc (Zn)	0-30	45 - 105%	0.005	µg/L
Boron (B)	0-30	70 - 130%	1	µg/L
Calcium (Ca)	0-30	70 - 130%	0.05	mg/L
Magnesium (Mg)	0-30	70 - 130%	0.05	mg/L
Sodium (Na)	0-30	70 - 130%	5	mg/L
Potassium (K)	0-30	70 - 130%	5	mg/L

6020 TOTAL METALS BY ICPMS- SOLID MATRIX

Aluminum (Al)	0-30	10 - 180%	1	µg/g
Antimony (Sb)	0-30	70 - 130%	0.025	µg/g
Arsenic (As)	0-30	70 - 130%	0.025	µg/g
Barium (Ba)	0-30	70 - 140%	0.025	µg/g
Beryllium (Be)	0-30	50 - 120%	0.025	µg/g
Bismuth (Bi)	0-30	70 - 130%	0.5	µg/g
Cadmium (Cd)	0-30	70 - 130%	0.025	µg/g
Chromium (Cr)	0-30	55 - 135%	0.025	µg/g
Cobalt (Co)	0-30	65 - 125%	0.025	µg/g
Copper (Cu)	0-30	65 - 125%	0.025	µg/g
Iron (Fe)	0-30	50 - 140%	1	µg/g
Lead (Pb)	0-30	55 - 120%	0.025	µg/g
Lithium (Li)	0-30	70 - 130%	0.05	µg/g
Manganese (Mn)	0-30	50 - 140%	0.025	µg/g
Mercury (Hg) (245.7)	0-30	65 - 140%	0.01	µg/dry g
Methylmercury	0-30	70 - 130%	0.01	µg/g
Molybdenum (Mo)	0-30	70 - 160%	0.025	µg/g
Nickel (Ni)	0-30	70 - 130%	0.025	µg/g
Selenium (Se)	0-30	60 - 125%	0.025	µg/g
Silicon (Si)	0-30	70 - 130%	0.1	µg/g
Silver (Ag)	0-30	50 - 120%	0.025	µg/g
Strontium (Sr)	0-30	50 - 160%	0.025	µg/dry g
Thallium (Tl)	0-30	65 - 125%	0.025	µg/g
Tin (Sn)	0-30	70 - 150%	0.025	µg/g
Titanium (Ti)	0-30	50 - 150%	0.025	µg/g

Vanadium (V)	0-30	50 - 160%	0.025	µg/g
Zinc (Zn)	0-30	60 - 120%	0.025	µg/g
Boron (B)	0-30	60 - 140%	0.025	µg/dry g
Calcium (Ca)	0-30	70 - 130%	1	µg/dry g
Magnesium (Mg)	0-30	70 - 130%	1	µg/dry g
Sodium (Na)	0-30	70 - 130%	1	µg/dry g
Potassium (K)	0-30	70 - 130%	1	µg/dry g

625 SEMI-VOLATILE ORGANICS BY GC/MS- LIQUID MATRIX

Polynuclear Aromatic Hydrocarbons

1-Methylnaphthalene	0-30	50 - 120%	1	ng/L
1-Methylphenanthrene	0-30	70 - 130%	1	ng/L
2,3,5-Trimethylnaphthalene	0-30	45 - 130%	1	ng/L
2,6-Dimethylnaphthalene	0-30	55 - 125%	1	ng/L
2-Methylnaphthalene	0-30	50 - 130%	1	ng/L
Acenaphthene	0-30	70 - 130%	1	ng/L
Acenaphthylene	0-30	60 - 120%	1	ng/L
Anthracene	0-30	60 - 130%	1	ng/L
Benz[a]anthracene	0-30	70 - 140%	1	ng/L
Benzo[a]pyrene	0-30	70 - 130%	1	ng/L
Benzo[b]fluoranthene	0-30	60 - 140%	1	ng/L
Benzo[e]pyrene	0-30	70 - 130%	1	ng/L
Benzo[g,h,i]perylene	0-30	50 - 140%	1	ng/L
Benzo[k]fluoranthene	0-30	70 - 130%	1	ng/L
Biphenyl	0-30	50 - 120%	1	ng/L
Chrysene	0-30	70 - 130%	1	ng/L
Dibenz[a,h]anthracene	0-30	60 - 130%	1	ng/L
Fluoranthene	0-30	70 - 130%	1	ng/L
Fluorene	0-30	70 - 130%	1	ng/L
Indeno[1,2,3-c,d]pyrene	0-30	70 - 130%	1	ng/L
Naphthalene	0-30	50 - 120%	1	ng/L
Perylene	0-30	65 - 135%	1	ng/L
Phenanthrene	0-30	70 - 130%	1	ng/L
Pyrene	0-30	70 - 130%	1	ng/L
Dibenzothiophene	0-30	70 - 130%	1	ng/L

Base Neutrals

1,2,4-Trichlorobenzene	0-30	65 - 140%	10	ng/L
1,2-Dichlorobenzene	0-30	30 - 130%	10	ng/L
1,3-Dichlorobenzene	0-30	MDL - 170%	10	ng/L
1,4-Dichlorobenzene	0-30	50 - 140%	10	ng/L
1,4-Dioxane	0-30	40 - 120%	50	ng/L
2,3,7,8-TCDD	0-30	40 - 120%	1	ng/L
2,4-Dinitrotoluene	0-30	70 - 130%	50	ng/L
2,6-Dinitrotoluene	0-30	40 - 120%	50	ng/L
2-Chloronaphthalene	0-30	60 - 140%	50	ng/L
2-Nitroaniline	0-30	40 - 120%	50	ng/L
3,3'-Dichlorobenzidine	0-30	60 - 140%	50	ng/L
3-Nitroaniline	0-30	20 - 120%	50	ng/L
4-Bromophenylphenylether	0-30	60 - 140%	50	ng/L
4-Chloroaniline	0-30	40 - 120%	50	ng/L

4-Chlorophenylphenylether	0-30	60 - 140%	50	ng/L
4-Nitroaniline	0-30	40 - 120%	50	ng/L
Acrylonitrile	0-30	40 - 120%	10	ng/L
Aniline	0-30	40 - 120%	50	ng/L
Azobenzene	0-30	40 - 120%	50	ng/L
Benzidine	0-30	60 - 140%	50	ng/L
bis (2-Ethylhexyl) phthalate	0-30	20 - 190%	5	ng/L
bis(2-Chloroethoxy)methane	0-30	60 - 140%	50	ng/L
bis(2-Chloroethyl)ether	0-30	60 - 140%	50	ng/L
bis(2-Chloroisopropyl)ether	0-30	60 - 140%	50	ng/L
bis(2-Ethylhexyl) Phthalate	0-30	20 - 190%	5	ng/L
Butylbenzyl Phthalate	0-30	65 - 160%	5	ng/L
Caffeine	0-30	60 - 140%	10	ng/L
Carbazole	0-30	40 - 120%	50	ng/L
Dibenzofuran	0-30	40 - 120%	50	ng/L
Dibutyl Phthalate	0-30	1 - 120%	5	ng/L
Diethyl Phthalate	0-30	50 - 150%	5	ng/L
Dimethyl Phthalate	0-30	40 - 155%	5	ng/L
Di-n-butyl Phthalate	0-30	65 - 145%	5	ng/L
Di-n-octyl Phthalate	0-30	50 - 165%	5	ng/L
Hexachlorobenzene	0-30	65 - 135%	1	ng/L
Hexachlorobutadiene	0-30	60 - 140%	50	ng/L
Hexachlorocyclopentadiene	0-30	60 - 140%	50	ng/L
Hexachloroethane	0-30	60 - 140%	50	ng/L
Isophorone	0-30	60 - 140%	50	ng/L
Nitrobenzene	0-30	60 - 140%	50	ng/L
N-Nitrosodimethylamine	0-30	60 - 140%	50	ng/L
N-Nitrosodi-n-propylamine	0-30	55 - 125%	50	ng/L
N-Nitrosodiphenylamine	0-30	60 - 140%	50	ng/L
Trifluralin	0-30	60 - 140%	1	ng/L
Pentachloronitrobenzene	0-30	60 - 140%	5	ng/L
Chlorothalonil	0-30	60 - 140%	5	ng/L
Molinate	0-30	60 - 140%	50	ng/L
Thiobencarb	0-30	60 - 140%	50	ng/L
Pendimethalin	0-30	60 - 140%	50	ng/L
Propargite	0-30	60 - 140%	50	ng/L
Oxyfluorfen	0-30	60 - 140%	50	ng/L

625 ACID EXTRACTABLE ORGANICS BY GC/MS- LIQUID MATRIX

2,4,6-Trichlorophenol	0-30	30 - 150%	50ng/L
2,4,6-Tribromophenol	0-30	10 - 160%	50ng/L
2,4-Dichlorophenol	0-30	40 - 140%	50ng/L
2,4-Dimethylphenol	0-30	30 - 120%	100ng/L

2,4-Dinitrophenol	0-30	MDL - 190%	100ng/L
2-Chlorophenol	0-30	35 - 130%	50ng/L
2-Methyl-4,6-dinitrophenol	0-30	MDL - 180%	100ng/L
2-Methylphenol	0-30	20 - 120%	100ng/L
2-Nitrophenol	0-30	30 - 180%	100ng/L
3-Methylphenol	0-30	20 - 120%	100ng/L
4-Chloro-3-methylphenol	0-30	30 - 150%	100ng/L
4-Nitrophenol	0-30	MDL - 130%	100ng/L
Benzoic Acid	0-30	40 - 120%	100ng/L
Benzyl Alcohol	0-30	20 - 120%	100ng/L
Pentachlorophenol	0-30	10 - 160%	50ng/L
Phenol	0-30	MDL - 115%	100ng/L
(2-Fluorobiphenyl)	0-30	60 - 130%	ng/L
Nonylphenol	0-30	70 - 130%	5ng/L

SEMI-VOLATILE ORGANICS BY GC/MS- SOLID MATRIX

8270 Polynuclear Aromatic Hydrocarbons

1-Methylnaphthalene	0-30	40 - 120%	1	ng/g
1-Methylphenanthrene	0-30	40 - 160%	1	ng/g
2,3,5-Trimethylnaphthalene	0-30	45 - 120%	1	ng/g
2,6-Dimethylnaphthalene	0-30	40 - 130%	1	ng/g
2-Methylnaphthalene	0-30	35 - 125%	1	ng/g
Acenaphthene	0-30	40 - 125%	1	ng/g
Acenaphthylene	0-30	40 - 130%	1	ng/g
Anthracene	0-30	45 - 150%	1	ng/g
Benz[a]anthracene	0-30	50- 175%	1	ng/g
Benzo[a]pyrene	0-30	50 - 160%	1	ng/g
Benzo[b]fluoranthene	0-30	45 - 160%	1	ng/g
Benzo[e]pyrene	0-30	40 - 160%	1	ng/g
Benzo[g,h,i]perylene	0-30	30 - 170%	1	ng/g
Benzo[k]fluoranthene	0-30	50 - 150%	1	ng/g
Biphenyl	0-30	45 - 120%	1	ng/g
Chrysene	0-30	40 - 160%	1	ng/g
Dibenz[a,h]anthracene	0-30	40 - 165%	1	ng/g
Fluoranthene	0-30	45 - 165%	1	ng/g
Fluorene	0-30	55 - 150%	1	ng/g
Indeno[1,2,3-c,d]pyrene	0-30	40 - 170%	1	ng/g
Naphthalene	0-30	30 - 120%	1	ng/g
Perylene	0-30	30 - 175%	1	ng/g
Phenanthrene	0-30	35 - 160%	1	ng/g
Pyrene	0-30	50 - 150%	1	ng/g
Dibenzothiophene	0-30	65 - 125%	1	ng/g

Base Neutrals

1,2,4-Trichlorobenzene	0-30	65 - 115%	10	ng/g
1,2-Dichlorobenzene	0-30	50 - 110%	10	ng/g
1,3-Dichlorobenzene	0-30	MDL - 175%	10	ng/g
1,4-Dichlorobenzene	0-30	45 - 135%	10	ng/g

1,4-Dioxane	0-30	40 - 120%	50	ng/g
2,3,7,8-TCDD	0-30	40 - 120%	1	ng/g
2,4-Dinitrotoluene	0-30	70 - 130%	50	ng/g
2,6-Dinitrotoluene	0-30	40 - 120%	50	ng/g
2-Chloronaphthalene	0-30	60 - 140%	50	ng/g
2-Nitroaniline	0-30	40 - 120%	50	ng/g
3,3'-Dichlorobenzidine	0-30	60 - 140%	50	ng/g
3-Nitroaniline	0-30	20 - 120%	50	ng/g
4-Bromophenylphenylether	0-30	60 - 140%	50	ng/g
4-Chloroaniline	0-30	40 - 120%	50	ng/g
4-Chlorophenylphenylether	0-30	60 - 140%	50	ng/g
4-Nitroaniline	0-30	40 - 120%	50	ng/g
Acrylonitrile	0-30	40 - 120%	10	ng/g
Aniline	0-30	40 - 120%	50	ng/g
Azobenzene	0-30	40 - 120%	50	ng/g
Benzidine	0-30	40 - 120%	50	ng/g
bis (2-Ethylhexyl) phthalate	0-30	MDL - 195%	5	ng/g
bis(2-Chloroethoxy)methane	0-30	60 - 140%	50	ng/g
bis(2-Chloroethyl)ether	0-30	60 - 140%	50	ng/g
bis(2-Chloroisopropyl)ether	0-30	60 - 140%	50	ng/g
bis(2-Ethylhexyl) Phthalate	0-30	5 - 160%	5	ng/g
Butylbenzyl Phthalate	0-30	MDL - 195%	5	ng/g
Caffeine	0-30	60 - 140%	10	ng/g
Carbazole	0-30	40 - 120%	50	ng/g
Dibenzofuran	0-30	40 - 120%	50	ng/g
Dibutyl Phthalate	0-30	1 - 120%	5	ng/g
Diethyl Phthalate	0-30	10 - 190%	5	ng/g
Dimethyl Phthalate	0-30	50 - 140%	5	ng/g
Di-n-butyl Phthalate	0-30	10 - 175%	5	ng/g
Di-n-octyl Phthalate	0-30	35 - 145%	5	ng/g
Hexachlorobenzene	0-30	65 - 135%	1	ng/g
Hexachlorobutadiene	0-30	60 - 140%	50	ng/g
Hexachlorocyclopentadiene	0-30	60 - 140%	50	ng/g
Hexachloroethane	0-30	60 - 140%	50	ng/g
Isophorone	0-30	60 - 140%	50	ng/g
Nitrobenzene	0-30	60 - 140%	50	ng/g
N-Nitrosodimethylamine	0-30	60 - 140%	50	ng/g
N-Nitrosodi-n-propylamine	0-30	40 - 120%	50	ng/g
N-Nitrosodiphenylamine	0-30	60 - 140%	50	ng/g
Trifluralin	0-30	60 - 140%	1	ng/g

8270 ACID EXTRACTABLE ORGANICS BY GC/MS- SOLID MATRIX

2,4,6-Trichlorophenol	0-30	35 - 145%	50	ng/g
2,4,6-Tribromophenol	0-30	10 - 165%	50	ng/g
2,4-Dichlorophenol	0-30	40 - 135%	50	ng/g
2,4-Dimethylphenol	0-30	30 - 120%	100	ng/g
2,4-Dinitrophenol	0-30	MDL - 190%	100	ng/g
2-Chlorophenol	0-30	15 - 140%	50	ng/g
2-Methyl-4,6-dinitrophenol	0-30	MDL - 180%	100	ng/g

2-Methylphenol	0-30	20 - 120%	100	ng/g
2-Nitrophenol	0-30	30 - 185%	100	ng/g
3-Methylphenol	0-30	20 - 120%	100	ng/g
4-Chloro-3-methylphenol	0-30	30 - 135%	100	ng/g
4-Nitrophenol	0-30	20 - 140%	100	ng/g
Benzoic Acid	0-30	40 - 120%	100	ng/g
Benzyl Alcohol	0-30	20 - 120%	100	ng/g
Pentachlorophenol	0-30	MDL - 150%	50	ng/g
Phenol	0-30	10 - 140%	100	ng/g
4-Methylphenol	0-30	20 - 120%	100	ng/g
3+4-Methylphenol	0-30	20 - 120%	100	ng/g

8270 CHLORINATED HYDROCARBONS BY GC/MS- SOLID MATRIX

2,4'-DDD	0-30	50 - 135%	1	ng/g
2,4'-DDE	0-30	60 - 130%	1	ng/g
2,4'-DDT	0-30	40 - 135%	1	ng/g
4,4'-DDD	0-30	70 - 130%	1	ng/g
4,4'-DDE	0-30	65 - 130%	1	ng/g
4,4'-DDT	0-30	35 - 140%	1	ng/g
Alachlor	0-30	60 - 140%	2	ng/g
Aldrin	0-30	50 - 125%	1	ng/g
BHC-alpha	0-30	60 - 120%	1	ng/g
BHC-beta	0-30	60 - 120%	1	ng/g
BHC-delta	0-30	60 - 120%	1	ng/g
BHC-gamma	0-30	60 - 120%	1	ng/g
Chlordane-alpha	0-30	70 - 130%	1	ng/g
Chlordane-gamma	0-30	60 - 120%	1	ng/g
cis-Nonachlor	0-30	60 - 120%	1	ng/g
DCPA (Dacthal)	0-30	60 - 140%	5	ng/g
Dieldrin	0-30	50 - 125%	1	ng/g
Endosulfan Sulfate	0-30	25 - 125%	1	ng/g
Endosulfan-I	0-30	45 - 125%	1	ng/g
Endosulfan-II	0-30	25 - 145%	1	ng/g
Endrin	0-30	60 - 125%	1	ng/g
Endrin Aldehyde	0-30	60 - 120%	1	ng/g
Endrin Ketone	0-30	45 - 125%	1	ng/g
Heptachlor	0-30	45 - 125%	1	ng/g
Heptachlor Epoxide	0-30	60 - 120%	1	ng/g
Methoxychlor	0-30	35 - 140%	1	ng/g
Mirex	0-30	50 - 130%	1	ng/g
Oxychlordane	0-30	70 - 130%	1	ng/g
Toxaphene	0-30	65 - 135%	10	ng/g
trans-Nonachlor	0-30	60 - 120%	1	ng/g
Perthane	0-30	60 - 140%	5	ng/g
Hexachlorobenzene	0-30	70 - 130%	1	ng/g
Aroclor 1016	0-30	65 - 135%	10	ng/g
Aroclor 1221	0-30	65 - 135%	10	ng/g
Aroclor 1232	0-30	65 - 135%	10	ng/g
Aroclor 1242	0-30	65 - 135%	10	ng/g

Aroclor 1248	0-30	65 - 135%	10	ng/g
Aroclor 1254	0-30	65 - 135%	10	ng/g
Aroclor 1260	0-30	65 - 135%	10	ng/g
PCB001	0-30	60 - 125%	1	ng/g
PCB002	0-30	60 - 125%	1	ng/g
PCB003	0-30	60 - 125%	1	ng/g
PCB004	0-30	60 - 125%	1	ng/g
PCB006	0-30	60 - 125%	1	ng/g
PCB008	0-30	60 - 125%	1	ng/g
PCB009	0-30	60 - 125%	1	ng/g
PCB016	0-30	60 - 125%	1	ng/g
PCB018	0-30	60 - 125%	1	ng/g
PCB019	0-30	60 - 125%	1	ng/g
PCB022	0-30	60 - 125%	1	ng/g
PCB025	0-30	60 - 125%	1	ng/g
PCB028	0-30	60 - 125%	1	ng/g
PCB031	0-30	60 - 125%	1	ng/g
PCB033	0-30	60 - 125%	1	ng/g
PCB037	0-30	60 - 125%	1	ng/g
PCB044	0-30	60 - 125%	1	ng/g
PCB049	0-30	60 - 125%	1	ng/g
PCB052	0-30	60 - 125%	1	ng/g
PCB056	0-30	60 - 125%	1	ng/g
PCB065	0-30	60 - 125%	1	ng/g
PCB066	0-30	60 - 125%	1	ng/g
PCB067	0-30	60 - 125%	1	ng/g
PCB070	0-30	60 - 125%	1	ng/g
PCB071	0-30	60 - 125%	1	ng/g
PCB074	0-30	60 - 125%	1	ng/g
PCB077	0-30	60 - 125%	1	ng/g
PCB081	0-30	60 - 125%	1	ng/g
PCB082	0-30	60 - 125%	1	ng/g
PCB087	0-30	60 - 125%	1	ng/g
PCB095	0-30	60 - 125%	1	ng/g
PCB097	0-30	60 - 125%	1	ng/g
PCB099	0-30	60 - 125%	1	ng/g
PCB101	0-30	60 - 125%	1	ng/g
PCB105	0-30	60 - 125%	1	ng/g
PCB110	0-30	60 - 125%	1	ng/g
PCB114	0-30	60 - 125%	1	ng/g
PCB118	0-30	60 - 125%	1	ng/g
PCB119	0-30	60 - 125%	1	ng/g
PCB123	0-30	60 - 125%	1	ng/g
PCB126	0-30	60 - 125%	1	ng/g
PCB128	0-30	60 - 125%	1	ng/g
PCB128+167	0-30	60 - 125%	1	ng/g
PCB132	0-30	60 - 125%	1	ng/g
PCB138	0-30	60 - 125%	1	ng/g
PCB141	0-30	60 - 125%	1	ng/g
PCB146	0-30	60 - 125%	1	ng/g

PCB147	0-30	60 - 125%	1	ng/g
PCB149	0-30	60 - 125%	1	ng/g
PCB151	0-30	60 - 125%	1	ng/g
PCB153	0-30	60 - 125%	1	ng/g
PCB156	0-30	60 - 125%	1	ng/g
PCB157	0-30	60 - 125%	1	ng/g
PCB158	0-30	60 - 125%	1	ng/g
PCB167	0-30	60 - 125%	1	ng/g
PCB168	0-30	60 - 125%	1	ng/g
PCB168+132	0-30	60 - 125%	1	ng/g
PCB169	0-30	60 - 125%	1	ng/g
PCB170	0-30	60 - 125%	1	ng/g
PCB173	0-30	60 - 125%	1	ng/g
PCB174	0-30	60 - 125%	1	ng/g
PCB177	0-30	60 - 125%	1	ng/g
PCB179	0-30	60 - 125%	1	ng/g
PCB180	0-30	60 - 125%	1	ng/g
PCB183	0-30	60 - 125%	1	ng/g
PCB187	0-30	60 - 125%	1	ng/g
PCB189	0-30	60 - 125%	1	ng/g
PCB194	0-30	60 - 125%	1	ng/g
PCB195	0-30	60 - 125%	1	ng/g
PCB200	0-30	60 - 125%	1	ng/g
PCB201	0-30	60 - 125%	1	ng/g
PCB203	0-30	60 - 125%	1	ng/g
PCB205	0-30	60 - 125%	1	ng/g
PCB206	0-30	60 - 125%	1	ng/g
PCB209	0-30	60 - 125%	1	ng/g

L

625 CHLORINATED HYDROCARBONS BY GC/MS- LIQUID MATRIX

2,4'-DDD	0-30	50 - 140%	1	ng/L
2,4'-DDE	0-30	60 - 130%	1	ng/L
2,4'-DDT	0-30	40 - 130%	1	ng/L
4,4'-DDD	0-30	70 - 130%	1	ng/L
4,4'-DDE	0-30	70 - 130%	1	ng/L
4,4'-DDT	0-30	MDL - 150%	1	ng/L
Alachlor	0-30	60 - 140%	2	ng/L
Aldrin	0-30	50 - 130%	1	ng/L
BHC-alpha	0-30	60 - 130%	1	ng/L
BHC-beta	0-30	65 - 125%	1	ng/L
BHC-delta	0-30	65 - 125%	1	ng/L
BHC-gamma	0-30	50 - 125%	1	ng/L
Chlordane-alpha	0-30	60 - 130%	1	ng/L
Chlordane-gamma	0-30	60 - 130%	1	ng/L
cis-Nonachlor	0-30	60 - 120%	1	ng/L
DCPA (Dacthal)	0-30	60 - 140%	5	ng/L
Dieldrin	0-30	65 - 125%	1	ng/L
Endosulfan Sulfate	0-30	60 - 125%	1	ng/L
Endosulfan-I	0-30	60 - 125%	1	ng/L

Endosulfan-II	0-30	60 - 125%	1	ng/L
Endrin	0-30	65 - 135%	1	ng/L
Endrin Aldehyde	0-30	60 - 110%	1	ng/L
Endrin Ketone	0-30	40 - 130%	1	ng/L
Heptachlor	0-30	45 - 135%	1	ng/L
Heptachlor Epoxide	0-30	65 - 130%	1	ng/L
Methoxychlor	0-30	MDL - 155%	1	ng/L
Mirex	0-30	50 - 125%	1	ng/L
Oxychlordane	0-30	60 - 120%	1	ng/L
Total Detectable DDTs	0-30			ng/L
Toxaphene	0-30	65 - 135%	10	ng/L
trans-Nonachlor	0-30	55 - 130%	1	ng/L
(PCB030)	0-30	40 - 130%		ng/L
Perthane	0-30	60 - 140%	5	ng/L
Total Chlordane	0-30			ng/L
Hexachlorobenzene	0-30	75 - 125%	1	ng/L
Dicofol	0-30	70 - 130%	50	ng/L
Aroclor 1016	0-30	65 - 135%	10	ng/L
Aroclor 1221	0-30	65 - 135%	10	ng/L
Aroclor 1232	0-30	65 - 135%	10	ng/L
Aroclor 1242	0-30	65 - 135%	10	ng/L
Aroclor 1248	0-30	65 - 135%	10	ng/L
Aroclor 1254	0-30	65 - 135%	10	ng/L
Aroclor 1260	0-30	65 - 135%	10	ng/L
PCB001	0-30	60 - 125%	1	ng/L
PCB002	0-30	60 - 125%	1	ng/L
PCB003	0-30	60 - 125%	1	ng/L
PCB004	0-30	60 - 125%	1	ng/L
PCB006	0-30	60 - 125%	1	ng/L
PCB008	0-30	60 - 125%	1	ng/L
PCB009	0-30	60 - 125%	1	ng/L
PCB016	0-30	60 - 125%	1	ng/L
PCB018	0-30	60 - 125%	1	ng/L
PCB019	0-30	60 - 125%	1	ng/L
PCB022	0-30	60 - 125%	1	ng/L
PCB025	0-30	60 - 125%	1	ng/L
PCB028	0-30	60 - 125%	1	ng/L
PCB031	0-30	60 - 125%	1	ng/L
PCB033	0-30	60 - 125%	1	ng/L
PCB037	0-30	60 - 125%	1	ng/L
PCB044	0-30	60 - 125%	1	ng/L
PCB049	0-30	60 - 125%	1	ng/L
PCB052	0-30	60 - 125%	1	ng/L
PCB056	0-30	60 - 125%	1	ng/L
PCB065	0-30	60 - 125%	1	ng/L
PCB066	0-30	60 - 125%	1	ng/L
PCB067	0-30	60 - 125%	1	ng/L
PCB070	0-30	60 - 125%	1	ng/L
PCB071	0-30	60 - 125%	1	ng/L
PCB074	0-30	60 - 125%	1	ng/L

PCB077	0-30	60 - 125%	1	ng/L
PCB081	0-30	60 - 125%	1	ng/L
PCB082	0-30	60 - 125%	1	ng/L
PCB087	0-30	60 - 125%	1	ng/L
PCB095	0-30	60 - 125%	1	ng/L
PCB097	0-30	60 - 125%	1	ng/L
PCB099	0-30	60 - 125%	1	ng/L
PCB101	0-30	60 - 125%	1	ng/L
PCB105	0-30	60 - 125%	1	ng/L
PCB110	0-30	60 - 125%	1	ng/L
PCB114	0-30	60 - 125%	1	ng/L
PCB118	0-30	60 - 125%	1	ng/L
PCB119	0-30	60 - 125%	1	ng/L
PCB123	0-30	60 - 125%	1	ng/L
PCB126	0-30	60 - 125%	1	ng/L
PCB128	0-30	60 - 125%	1	ng/L
PCB128+167	0-30	60 - 125%	1	ng/L
PCB132	0-30	60 - 125%	1	ng/L
PCB138	0-30	60 - 125%	1	ng/L
PCB141	0-30	60 - 125%	1	ng/L
PCB146	0-30	60 - 125%	1	ng/L
PCB147	0-30	60 - 125%	1	ng/L
PCB149	0-30	60 - 125%	1	ng/L
PCB151	0-30	60 - 125%	1	ng/L
PCB153	0-30	60 - 125%	1	ng/L
PCB156	0-30	60 - 125%	1	ng/L
PCB157	0-30	60 - 125%	1	ng/L
PCB158	0-30	60 - 125%	1	ng/L
PCB167	0-30	60 - 125%	1	ng/L
PCB168	0-30	60 - 125%	1	ng/L
PCB168+132	0-30	60 - 125%	1	ng/L
PCB169	0-30	60 - 125%	1	ng/L
PCB170	0-30	60 - 125%	1	ng/L
PCB173	0-30	60 - 125%	1	ng/L
PCB174	0-30	60 - 125%	1	ng/L
PCB177	0-30	60 - 125%	1	ng/L
PCB179	0-30	60 - 125%	1	ng/L
PCB180	0-30	60 - 125%	1	ng/L
PCB183	0-30	60 - 125%	1	ng/L
PCB187	0-30	60 - 125%	1	ng/L
PCB189	0-30	60 - 125%	1	ng/L
PCB194	0-30	60 - 125%	1	ng/L
PCB195	0-30	60 - 125%	1	ng/L
PCB200	0-30	60 - 125%	1	ng/L
PCB201	0-30	60 - 125%	1	ng/L
PCB203	0-30	60 - 125%	1	ng/L
PCB205	0-30	60 - 125%	1	ng/L
PCB206	0-30	60 - 125%	1	ng/L
PCB209	0-30	60 - 125%	1	ng/L

625 ORGANOPHOSPHORUS PESTICIDES BY GC/MS- LIQUID MATRIX

Bolstar (Sulprofos)	0-30	65 - 125%	2	ng/L
Chlorpyrifos	0-30	65 - 125%	1	ng/L
Coumaphos	0-30	65 - 125%	5	ng/L
Demeton	0-30	45 - 105%	1	ng/L
Diazinon	0-30	65 - 125%	2	ng/L
Dichlorvos	0-30	65 - 125%	3	ng/L
Dimethoate	0-30	65 - 125%	3	ng/L
Disulfoton	0-30	45 - 105%	1	ng/L
Ethoprop (Ethoprofos)	0-30	65 - 125%	1	ng/L
Fenchlorphos (Ronnel)	0-30	65 - 125%	2	ng/L
Fensulfothion	0-30	65 - 125%	1	ng/L
Fenthion	0-30	65 - 125%	2	ng/L
Guthion	0-30	65 - 125%	10	ng/L
Malathion	0-30	65 - 125%	3	ng/L
Merphos	0-30	65 - 125%	1	ng/L
Methyl Parathion	0-30	60 - 120%	1	ng/L
Mevinphos (Phosdrin)	0-30	65 - 125%	8	ng/L
Phorate	0-30	45 - 105%	6	ng/L
Tetrachlorvinphos (Stirofos)	0-30	65 - 125%	2	ng/L
Tokuthion	0-30	65 - 125%	3	ng/L
Trichloronate	0-30	65 - 125%	1	ng/L
Methamidophos (Monitor)	0-30	65 - 125%	50	ng/L
Ethyl Parathion	0-30	60 - 120%	10	ng/L
Methidathion	0-30	60 - 120%	10	ng/L
Phosmet	0-30	60 - 120%	50	ng/L
Azinphos Methyl	0-30	60 - 120%	10	ng/L

8270 ORGANOPHOSPHORUS PESTICIDES BY GC/MS- SOLID MATRIX

Bolstar (Sulprofos)	0-30	65 - 125%	10	ng/g
Chlorpyrifos	0-30	65 - 125%	5	ng/g
Coumaphos	0-30	65 - 125%	10	ng/g
Demeton	0-30	MDL - 145%	10	ng/g
Diazinon	0-30	45 - 125%	5	ng/g
Dichlorvos	0-30	65 - 125%	10	ng/g
Dicofol	0-30	65 - 125%	1	ng/g
Dimethoate	0-30	MDL - 160%	5	ng/g
Disulfoton	0-30	MDL - 155%	10	ng/g
Ethoprop (Ethoprofos)	0-30	65 - 125%	10	ng/g
Fenchlorphos (Ronnel)	0-30	65 - 125%	10	ng/g
Fensulfothion	0-30	10 - 160%	10	ng/g
Fenthion	0-30	10 - 150%	10	ng/g
Guthion	0-30	65 - 125%	10	ng/g
Malathion	0-30	65 - 125%	5	ng/g
Merphos	0-30	MDL - 165%	10	ng/g
Methyl Parathion	0-30	60 - 120%	10	ng/g
Mevinphos (Phosdrin)	0-30	65 - 125%	10	ng/g
Phorate	0-30	MDL - 150	10	ng/g
Tetrachlorvinphos (Stirofos)	0-30	65 - 125%	10	ng/g

Tokuthion	0-30	65 - 125%	10	ng/g
Trichloronate	0-30	65 - 125%	10	ng/g
Methamidophos (Monitor)	0-30	65 - 125%	50	ng/g
Ethyl Parathion	0-30	60 - 120%	10	ng/g
Methidathion	0-30	60 - 120%	10	ng/g
Phosmet	0-30	60 - 120%	50	ng/g
Azinphos Methyl	0-30	60 - 120%	50	ng/g

625 PYRETHROID PESTICIDES BY GC/MS- LIQUID MATRIX

Allethrin	0-30	65 - 125%	5	ng/L
Bifenthrin	0-30	65 - 125%	5	ng/L
Cyfluthrin	0-30	65 - 125%	5	ng/L
Cypermethrin	0-30	65 - 125%	5	ng/L
Danitol	0-30	65 - 125%	5	ng/L
Deltamethrin	0-30	65 - 125%	5	ng/L
L-Cyhalothrin	0-30	65 - 125%	5	ng/L
Permethrin	0-30	65 - 125%	5	ng/L
Prallethrin	0-30	65 - 125%	5	ng/L
Esfenvalerate/Fenvalerate	0-30	65 - 125%	5	ng/L
Pyrethrins	0-30	65 - 125%	100	ng/L
Piperonyl Butoxide	0-30	65 - 125%	5	ng/L
Esfenvalerate	0-30	65 - 125%	5	ng/L
Fenvalerate	0-30	65 - 125%	5	ng/L

8270 PYRETHROID PESTICIDES BY GC/MS- SOLID MATRIX

Allethrin	0-30	70 - 130%	5	ng/g
Bifenthrin	0-30	55 - 130%	5	ng/g
Cyfluthrin	0-30	65 - 130%	5	ng/g
Cypermethrin	0-30	70 - 130%	5	ng/g
Danitol	0-30	65 - 130%	5	ng/g
Deltamethrin	0-30	60 - 120%	5	ng/g
L-Cyhalothrin	0-30	55 - 120%	5	ng/g
Permethrin	0-30	70 - 130%	5	ng/g
Prallethrin	0-30	35 - 130%	5	ng/g
Esfenvalerate/Fenvalerate	0-30		5	ng/g
Pyrethrins	0-30	30 - 120%	100	ng/g

625 TRIAZINE PESTICIDES BY GC/MS- LIQUID MATRIX

1,2-Diphenylhydrazine	0-30	70 - 130%	5	ng/L
Atraton	0-30	70 - 130%	5	ng/L
Simazine	0-30	70 - 130%	5	ng/L
Prometon	0-30	70 - 130%	5	ng/L
Atrazine	0-30	70 - 130%	5	ng/L
Propazine	0-30	70 - 130%	5	ng/L
Terbuthylazine	0-30	70 - 130%	5	ng/L
Secbumeton	0-30	70 - 130%	5	ng/L
Simetryn	0-30	70 - 130%	5	ng/L
Ametryn	0-30	70 - 130%	5	ng/L
Prometryne	0-30	70 - 130%	5	ng/L

Terbutryn	0-30	70 - 130%	5	ng/L
Cyanazine	0-30	70 - 130%	5	ng/L

8270 TRIAZINE PESTICIDES BY GC/MS- SOLID MATRIX

1,2-Diphenylhydrazine	0-30	65 - 125%	5	ng/g
Atraton	0-30	50 - 120%	5	ng/g
Simazine	0-30	35 - 135%	5	ng/g
Prometon	0-30	65 - 125%	5	ng/g
Atrazine	0-30	50 - 125%	5	ng/g
Propazine	0-30	35 - 140%	5	ng/g
Terbuthylazine	0-30	40 - 135%	5	ng/g
Secbumeton	0-30	40 - 120%	5	ng/g
Simetryn	0-30	MDL - 145%	5	ng/g
Ametryn	0-30	MDL - 150%	5	ng/g
Prometryne	0-30	35 - 130%	5	ng/g
Terbutryn	0-30	10 - 135%	5	ng/g
Cyanazine	0-30	65 - 125%	5	ng/g

INORGANIC CHEMISTRY – CONVENTIONAL CONSTITUENTS

SM4500NH3 F	Ammonia (as N)	0-30	70-130	0.01 mg/L
SM 4500 Cl^-	Chloride	0-30	70-130	0.01 mg/L
SM10200H	Chlorophyll-a	0-30	70-130	0.005mg/m^3
SM2510	Conductivity	0-30	70-130	0.1 mS/m
SM 3500-F D	Fluoride	0-30	70-130	0.01 mg/L
SM 4500NO_3 E	Nitrate (as N)	0-30	70-130	0.01 mg/L
SM 4500NO_2 B	Nitrite (as N)	0-30	70-130	0.01 mg/L
SM4500P E	Orthophosphate (as P)	0-30	70-130	0.01 mg/L
EPA 150.1	pH	0-30	70-130	0.1 pH Unit
SM4500P E	Soluble Reactive Phosphorus	0-30	70-130	0.075 mg/L
SM2540 C	Total Dissolved Solids	0-30	70-130	5.0 mg/L
SM2340 B	Total Hardness	0-30	70-130	1.0 mg/L
SM4500P C	Total Phosphorus	0-30	70-130	0.016 mg/L
SM4500SO_4 F	Total Sulfate	0-30	70-130	0.01 mg/L
SM2540 D	Total Suspended Solids	0-30	70-130	4.0 mg/L
EPA 180.1	Turbidity	0-30	70-130	1.0 NTU

MDL: Method Detection Limits

Table 2. Microbiology

METHOD	ANALYSIS	MAXIMUM HOLDING TIME	MDL
	INDICATOR BACTERIA- STORM, SEA & RECREATIONAL WATER		
SM9221B	Total Coliform	6 hrs	2 MPN/100 mL
SM9222B	Total Coliform	6 hrs	2 CFU/100 mL
SM9223B	Total Coliform	6 hrs	2 MPN/100 Ml
SM9221E	Fecal Coliform	6 hrs	2 MPN/100 mL
SM9222D	Fecal Coliform	6 hrs	2 CFU/100 mL
SM9223B	*E. coli*	6 hrs	2 MPN/100 mL
EPA1600	Enterococci	6 hrs	1 CFU/100 mL
SM9230C	Enterococci	6 hrs	1 CFU/100 mL
Enterolert	Enterococci	6 hrs	1 MPN/100 mL
SM9215B/C	Heterotrophic Plate Count	6 hrs	1 CFU/1mL
	INDICATOR BACTERIA- DRINKING WATER		
SM9223B	Total Coliform	24 hrs	Presence/Absence
SM9223B	*E. coli*	24 hrs	Presence/Absence
EPA1600	Enterococci	6 hrs	1 CFU/100 mL
SM9215B/C	Heterotrophic Plate Count	6 hrs	1 CFU/1mL
	BACTERIOPHAGE		
Adams	Coliphage	6 hrs	1 PFU/100 mL

MPN: Most Probable Number
CFU: Colony Forming Unit
PFU: Plaque Forming Unit