Quality Assurance Project Plan

Polychlorinated Biphenyls in Municipal Products

Prepared for:
City of Spokane

Washington Department of Ecology Grant No:
G1400545

Final

Date: August 5, 2014

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Approved by:

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1 Background

PCBs are a toxic environmental contaminant found ubiquitously in the environment. PCBs are a pollutant of concern in many Washington State watersheds. There were 113 Category 5 listings on the Washington 2008 303(d) list, and PCBs are a priority in many watersheds such as the Spokane River, Lower Duwamish Waterway, the Wenatchee River, and Lake Washington. Once thought to be a legacy contaminant, PCBs have been found in numerous commercially available products such as motor oil, hydraulic fluid, pigments, and caulk. These products can easily come into contact with rain water and contribute to PCBs in stormwater runoff. Municipalities are concerned about the presence of PCBs in commonly used products such as yellow road paint, asphalt sealers, and de-icer, for example. However, limited data is available as to the concentration of PCBs in products used for road and facility maintenance. The purpose of this project is to perform PCB analysis on products commonly used by municipalities. The information will be used to inform permittees and to help them make decisions about pollution prevention measures to prevent PCBs from entering stormwater runoff. Data gathered from this project will also be beneficial to statewide efforts to identify and reduce PCB sources. This project is supported by the Spokane River Regional Toxics Task Force, the Washington Stormwater Center, Asotin County, the City of Pullman, the City of Spokane Valley, and the City of Pasco, who have a common interest in the identification and reduction of PCBs in the Spokane River watershed and across the State of Washington.

Product sampling and PCB analysis for this project will build on Ecology's growing datasets, such as the recent sampling performed by Ecology on pigments and caulks. This project not only aids municipalities in stormwater pollution prevention, but also helps meet objectives of Toxics Management Plans in the Spokane region's NPDES Waste Discharge permits and pollution identification and reduction efforts of the Spokane River Regional Toxics Task Force. The data will also help identify products where green chemistry may be beneficial to reduce incidental production of PCBs in the manufacturing process.

1.1 Polychlorinated Biphenyl

PCBs are a class of persistent, bioaccumulative and toxic compounds that were historically used in a wide range of consumer products. PCBs are created by reacting biphenyl with chlorine (Ponerantz, 1978). Historically, PCBs were used in electrical transformers and capacitors, heat transfer and hydraulic systems and vacuum pumps and lubricants, surface coatings, adhesives, plasticizers, inks, insulating materials and pesticides (UNEP, 1999). Total worldwide production from 1929 to 1989 is estimated at 1.5 million tons of which 60% of the worldwide production and 77% of the United States production was used in the manufacture of transformers or capacitors (Anderson, 2013). PCBs were valued for their persistence, inability to conduct electricity and anti-microbial effects. Current releases of PCBs are primarily due to a cycling of historic releases with slight additions from current uses and inadvertent sources.

Products used by municipalities can be inadvertent sources. Materials and products containing less than 50 parts per million (ppm) are not regulated under the Toxics Substances Control Act (TSCA) and are not considered "PCB-contaminated" (40 CFR 761.3). For comparison, the current EPA human health surface water quality standard for PCBs is 170 picograms per liter, equivalent to 0.00000017 ppm (National Toxics Rule, 40 CFR 131.36). The Spokane Tribe adopted a water quality standard of 1.3 picograms per liter (0.0000000013 ppm) due to higher fish consumption rates used to derive the standard.

2 Project Description

The City of Spokane will conduct a study of municipal products that have the potential to contain PCBs. PCBs have been detected in City stormwater above water quality standards. The purpose of this project is to identify PCBs in commonly used municipal products that may come into contact with stormwater making its way to the Spokane River. Products to be tested include road paint, ashphalt sealers, motor oils and de-icer.

This project will provide jurisdictions and other interested parties around the state with information on the content of PCBs in commonly used products. The information gained from this study will enhance the body of stormwater knowledge across the state and beyond. Little is known about the content of PCBs in products, yet they can potentially contribute PCBs to impaired watersheds through contact with stormwater. The first step to reducing PCB contamination in stormwater is to identify the sources.

City of Spokane departments have been queried for products they frequently use that have the potential to come into contact with stormwater. Each of the selected products will be sampled and sent to Pacific Rim Laboratories for analysis. A report will be prepared detailing these analytical results. The information will be used to support pollution prevention measures and elimination by identifying PCBs in commonly used municipal products that come into contact with stormwater. This data can also be used for public education and public involvement activities, informing citizens about PCBs and impacts to water quality and human health.

A total of 36 municipal products have been identified to be included in this study. These products will be sampled and analyzed for PCBs using EPA Method 1668C.

A systematic planning process was used in this study. PCBs are a pollutant of concern in Washington State watersheds. The Spokane River and Lake Spokane exceed the water quality standard (170 pg/L – based on fish consumption rate of 6.5 g/day) for polychlorinated biphenyls (PCBs) in several segments. Fifteen waterbody segments of the Spokane River and Lake Spokane are on the 2008 303 (d) list for exceeding human health water quality criteria for PCBs. The objective of this product is to identify potential sources of PCBs to stormwater entering the Spokane River. Sampling and analysis of municipal products with the potential to come in contact with stormwater is intended to answer the study question and meet the project objective. The municipal products used in the study have been identified by the City of Spokane. The information required includes the PCB concentrations of the municipal products identified. The requirements for data quality are provided in this QAPP. The study design is constrained by the budget which was provided by a Department of Ecology grant.

3 Organization and Schedule

3.1 Project Team Responsibilities

Each of the organizations included in the project team has established an organizational structure for providing technical direction and administrative control to accomplish quality-related activities for the development of the project.

Key project personnel and their corresponding responsibilities are listed in Table 1 below. An organization chart is provided in Figure 1.

Table 1. Project Team Responsibilities

Name	Affiliation	Phone Number/email	Project Title/Responsibility
Dale Arnold	Director City of Spokane Wastewater Management	509.625.7901 darnold@spokanecity.org	**Oversight and direction** Reviews and approves QAPP
Lynn Schmidt	Stormwater Permit Coordinator City of Spokane Wastewater Management	509.625.7908 lschmidt@spokanecity.org	**Project Manager** Reviews and approves QAPP Data management and validation Analysis and report writing
Jeff Donovan	Chemist City of Spokane RPWRF	509.625.4638 jdonovan@spokanecity.org	**Project Quality Assurance Officer** Performs systematic evaluation of data quality Receives notices, initiates investigation, and documents nonconformance with DQOs; Reviews QAPP and performs data management
Cathy Whiting	Project Engineer LimnoTech	734.332.1200 cwhiting@limno.com	QAPP Preparation
Mike Cannon	Project Laboratory Manager City of Spokane RPWRF	509.625.4642 mcannon@spokanecity.org	**Technical Director** Reviews QAPP Supervises sampling and analysis activities
Gary Bussiere	Laboratory Technician City of Spokane RPWRF	509.625.4628 gbussiere@spokanecity.org	Sample collection and data entry
Kyle Arrington	Laboratory Technician City of Spokane RPWRF	509.625.4647 karrington@spokanecity.org	Sample collection and data entry
Dave Hope	Project Manager/Technical Director/QA Manager Pacific Rim Laboratory	604.532.8711 dave@pacificrimlabs.com	Conduct analyses Serves as main point of contact for laboratory Manages laboratory Quality Assurance systems Initiates corrective actions for nonconformance Manage Laboratory QA/QC activities

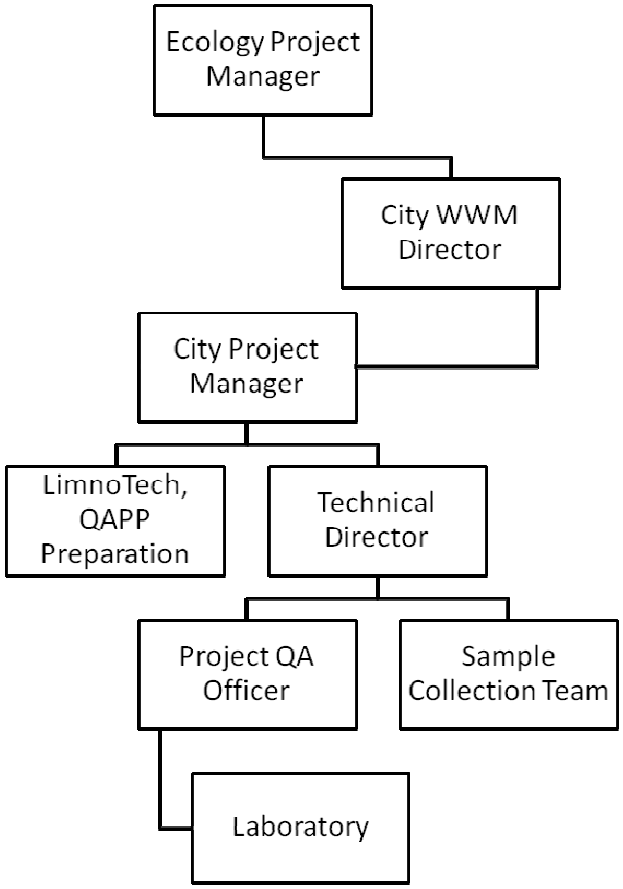

Figure 1. Organization Chart

All of the organizations in the project have the responsibility of ensuring that their employees receive the appropriate technical and administrative direction that is provided by this QAPP.

Each team member has responsibility for performance of assigned quality control duties in the course of accomplishing identified activities. The quality control duties include:

- Completing the assigned task on or before schedule and in a quality manner in accordance with established procedures; and
- Ascertaining that the work performed is technically correct and meets all aspects of the QAPP.

3.2 Schedule

The proposed schedule for completing this project is provided in Table 2.

Table 2. Project Schedule

Task	Due Date
Product Selection	May 1, 2014
Draft QAPP Developed	June 17, 2014
Ecology QAPP Review	July 18, 2014
Identify Specific Products	June 17, 2014
Collect Samples (Summer Products)	August 29, 2014
Laboratory Analyses	October 24, 2014
Collect Samples (Winter Products, if needed)	November 1, 2014
Laboratory Analysis (if needed)	January 2, 2015
Data Review and Draft Report	January 30, 2015
Ecology Review Draft Report	February 13, 2015
Final Report Submission	February 28, 2015

3.3 Budget

The funding for the PCBs in Municipal Products project comes from a Department of Ecology 2013-2015 Biennial Municipal Stormwater Grant of Regional or Statewide Significance (Grant Number: G1400545), which expires February 28, 2015. The current allotted budget is provided in Table 3.

Table 3. Project Budget

Task Element	Project Cost
Project Administration/Management	$1,145
Develop QAPP	$10,239
Product Review and Selection	$2,195
Product Testing	$34,074
Reporting	$1,432
TOTAL	**$49,085**

4 Quality Objectives

The quality objectives for this project are to obtain data of sufficient quality to minimize uncertainty.

The data quality objectives are intended to clarify the study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of the data needed to support decisions. The measurement quality

objectives (MQOs) for this study have been developed in order to ensure that the data collected are of acceptable quality and support the objectives of the project.

The MQOs and the measurement performance criteria for each are provided in Table 4.

Table 4. Measurement Quality Objectives

Analyte	Analytical Method	Daily Calibration Verification	Laboratory Control Samples	Surrogate Recovery	Laboratory Blanks	Laboratory Duplicate	Field Replicate	Sensitivity
		% recovery limits	% recovery limits	% recovery limits	Concentration (total PCBs) (ppb)	Relative Percent Difference	Relative Percent Difference	Detection Limit/congener (ppb)
PCB Congeners	EPA 1668C	50-145%	60-135%	5-145%[a] 10-145%[b]	0.05-0.2	± 25%[c]	± 25%	0.02 to 0.1

a – MoCB-TriCB

b – remaining congeners

c – applies only when values are greater than 10 times the detection limit

4.1 Accuracy

Accuracy is the degree of agreement between a measured value and the "true" or expected value. Pacific Rim Laboratories will do the PCB analyses using EPA Method 1668C to perform low level analysis for 209 PCB congeners using HRGS/HRMS instrumentation. The laboratory will analyze the samples and laboratory QA/QC samples using the laboratory analytical procedures and the analytical method to assess data quality.

Laboratory bias will be assessed through daily calibration verification and laboratory control samples (LCS) to determine if the percent recoveries (%R) meet the MQOs. For PCB analyses the LCS samples are the Ongoing Precision and Recovery (OPR), internal standards and labeled compounds.

4.2 Precision

Precision is a measure of reproducibility of analytical results. It can be defined as the measure of agreement among repeated measurements of the same property under identical, or substantially similar conditions. Total precision is a function of the variability associated with both sampling and analysis. Replicate analyses will be performed to verify analytical reproducibility. Field precision is assessed through the collection and measurement of field replicates. Relative Percent Difference (RPD) shall be calculated for each of the replicates collected for all the parameters analyzed.

The precision of the laboratory analysis for PCB will be determined through a laboratory duplicate that will be generated in the laboratory and is spiked with all PCB natives and all surrogates. This sample is run with all batches.

4.3 Representativeness

Representativeness is the degree to which sample data accurately reflect the characteristics of a population of samples and appropriately reflect the condition being measured. Because there is one sample for each product, it is not possible to establish a numeric MQO for representativeness.

Due to budget constraints only one sample of each product will be analyzed. The purpose of the project is to identify potential PCB sources to stormwater, not to determine the exact concentration of PCBs in each product.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount of data that were expected. The completeness goal is 100%. However, events that may contribute to reduction in measurement completeness include sample container breakage and laboratory equipment failures.

Laboratory completeness is a measure of the amount of valid measurements obtained from all samples submitted for each sampling activity. The Laboratory validates the numbers of valid measurements based on standard processes. The completeness criterion for all measurements is 95 percent. Qualified data are included as valid measurements and will be addressed in the data analysis. The completeness criterion will be evaluated by the Project Manager and QAO in accordance with the data analysis procedures. If the completeness goal is not met, re-sampling and/or re-analyzing may be necessary.

4.5 Comparability

Comparability is the confidence with which one dataset can be compared to another. It is achieved by maintaining standard techniques and procedures for collecting and analyzing samples and reporting the analytical results in standard units. Results of performance evaluation samples and systems audits will provide additional information for assessing comparability of data.

The objective for data comparability is to generate data for each parameter that are comparable over time. Data comparability will be promoted by:

1. Using standard U.S. EPA approved methods, where possible.
2. Consistently following the sampling methods detailed in the QAPP.
3. Consistently following the analytical methods detailed in the QAPP.
4. Achieving the required Estimated Detection Limits detailed in the QAPP.

All sample collection and analytical methods will be specified, and any deviations from the methods will be documented. All results will be reported in the standard units shown in Table 4. The standards used for PCB natives and labeled surrogate analyses will be procured from qualified sources. The data review and validation process is intended to evaluate whether or not the measurements were made and the physical samples were collected in such a manner that the resulting data is comparable with other datasets.

4.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. Sensitivity is determined by the minimum concentration or attribute that can be measured by a method (estimated detection limit), by an instrument (instrument detection limit), or by a laboratory (quantitation limit).

Estimated Detection Limit (EDL) is defined as the concentration or amount of an analyte which can be determined to a specified level of certainty to be greater than zero. The Estimated Quantitation Limit (EQL) is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. EQLs are normally arbitrarily set rather than explicitly determined.

The required detection limits are provided in Tables 4. Detected values below the EQL will be qualified with a J flag. Results below the EDL will be reported as non-detect.

5 Sampling Process Design

Approximately 40 products will be gathered for testing during this sampling program. The samples will be analyzed for PCB congeners using EPA Method 1668C. Information has been assimilated from a number of different sources to identify municipal products that may contain PCBs.

To ensure testing of appropriate materials, the City of Spokane has identified which products they commonly use that have the potential to come into contact with stormwater. Items include road paint, asphalt sealers, de-icer, adhesives, caulk, lubricants, pesticides, and vehicle wash soap. A survey was conducted focusing on products used by the City of Spokane; however, partnering jurisdictions and the Washington Stormwater Center were also solicited for technical input. Based on the survey findings and comments received from partnering jurisdictions and the Washington Stormwater Center, the City of Spokane selected 36 products for initial testing prioritized based on greatest pollution potential. The municipal product list is provided in Table 5. Municipal products that are of a secondary priority are provided in Table 6. Samples of the products in this category may be collected if any of the higher priority product samples in Table 5 cannot be collected. If the product brand is not listed, the most available brand at the time of sampling will be used.

Additional products that will be sampled by the City of Spokane but are not included in the Stormwater and Municipal Grant are provided in Table 7. The City of Spokane will be utilizing separate resources to analyze these samples.

The sampling will be conducted in August and September 2014. It is possible that some products will not be available until late fall, such as deicer. If required, sampling of winter products will be conducted when the products become available. Each product will be sampled once, but it may take several weeks to completed the sampling process on the entire list of products. The sampling will be conducted at the City of Spokane.

Table 5. Municipal Product Analysis List

Product	Product ID Number	Type	Brand/Type	Use Location
Yellow Road Paint	001	Liquid	Ennis Standard #2 – WA State Contract	Spokane Streets Department
Yellow Road Paint	002	Liquid	Sherwin Williams 2153	Pullman or Asotin
White Road Paint	003	Liquid	Ennis Standard #2	Spokane Streets Department
White Road Paint	004	Liquid	Sherwin Williams 2152	Pullman or Asotin
Hydrant Paint	005	Liquid/Spray Paint	Rustoleum Pro HP Enamel - Aluminum	Spokane Water Department
Utility Locate Paint	006	Liquid/Spray Paint	Rustoleum – green	Spokane Wastewater Management Department

Product	Product ID Number	Type	Brand/Type	Use Location
Class B Firefighting Foam	007	Liquid		Spokane Fire Department
Deicer	008	Liquid	MgCl	Spokane Streets Department
Deicer	009	Liquid	SB Boost	WSDOT
Vehicle Wash Soap	010	Liquid	SuperXL, Hotsy	Spokane Fleet Maintenance
Vehicle Wash Soap	011	Liquid	Simple Green	Spokane Fleet Maintenance
Pesticide/Herbicide	012	Liquid	2-4D: Weedar 64	Spokane Streets Department
Pesticide/Herbicide	013	Liquid	Portfolio	Spokane Streets Department
Pesticide/Herbicide	014	Liquid	Roundup Pro Max	Spokane Streets Department
Pesticide/Herbicide	015	Liquid	Surfactants: crosshair	Spokane Streets Department
Motor Oil	016	Liquid	15-40 Firebird (bulk), Connell Oil	Spokane Fleet Maintenance
Motor Oil	017	Liquid	Valvoline Full Synthetic 5W-30	Store bought
Used Motor Oil	018	Liquid	15-40 Firebird (bulk), Connell Oil	Spokane Fleet Maintenance
Diesel	019	Liquid	NA	Spokane Wastewater Management
Gasoline	020	Liquid	NA	Spokane Wastewater Management
Dirt Road Dust Suppressant	021	Liquid	Asphalt emulsion – EADA	Spokane Streets Department
Dirt Road Dust Suppressant	022	Liquid	Lignosulfonate (natural polymer in wood)	Spokane Streets Department
Dirt Road Dust Suppressant	023	Liquid	MgCl	Spokane Streets Department
Lubricant	024	Liquid	Union 76, Connell Oil	Spokane Fleet Maintenance
Asphalt Sealer	025	Viscous Liquid/Gel	SSR1 asphalt tack	Spokane Streets Department
Crack Sealer	026	Viscous Liquid/Gel	Special Asphalt SA Premier	Spokane Valley Vendor Warehouse or Spokane Streets Department
Asphalt Release Agent	027	Viscous Liquid/Gel		Spokane Streets Department or Vendor Warehouse
Hydroseed	028	Viscous Liquid/Gel		Contact Spokane Construction Management
PVC Pipe	029	Solid		Spokane Wastewater Management
Cured in place pipe (CIPP) liner	030	Solid		Spokane Wastewater Management
Short liner	031	Solid		Spokane Wastewater Management

Product	Product ID Number	Type	Brand/Type	Use Location
Yellow Road Paint – dried	032	Solid	Ennis standard #2	Spokane Streets Department
White Road Paint – dried	033	Solid	Ennis standard #2	Spokane Streets Department
Thermoplastic Tape Road Striping - Yellow	034	Solid		Spokane Streets Department
Antifreeze	035	Liquid		Spokane Fleet Maintenance
Thermoplastic Tape Road Striping - White	036	Solid		Spokane Streets Department

Table 6. Municipal Product List – Secondary Priority

Product	Product ID Number	Type	Brand	Use Location
DEF	037	Liquid	Air1, Connell Oil	Spokane Fleet Maintenance
Pesticide/Herbicide	038	Liquid	Diron 4L	Spokane Streets Department
Hydraulic Fluid	039	Liquid	In-stock brand	Spokane Fleet Maintenance
Brake Fluid	040	Liquid	In-stock brand	Spokane Fleet Maintenance
Dirt Road Dust Suppressant	041	Liquid	MgCl	Spokane Streets Department
Motor Oil	042	Liquid	15-40 Guardol (bottles), Connell Oil	Spokane Fleet Maintenance
Motor Oil	043	Liquid	Federated synthetic oil, Motion Auto	Spokane Fleet Maintenance
Motor Oil	044	Liquid	Chevron Delo 400 15W40 LE	Spokane Valley, Pullman, or Asotin Co
Utility Locate Paint	045	Liquid/Spray Paint	Rustoleum – pink	
Utility Locate Paint	046	Liquid/Spray Paint	Rustoleum – white	
Utility Locate Paint	047	Liquid/Spray Paint	Rustoleum – blue	
Windshield Fluid	048	Liquid	Xtreme Blue, Six Robblees	Spokane Fleet Maintenance

Table 7. Additional Products – Not included in the Ecology Grant

Product	Product ID Number	Product	Product ID Number
Hand Soap	101	Shampoo	104

Product	Product ID Number	Product	Product ID Number
Laundry Soap	102	Toothpaste	105
Dish Soap	103		

6 Sampling Procedures

This section provides a description of the sample collection methods, sampling equipment, and decontamination procedures that will be used for the municipal product sampling program.

6.1 Sample Collection/Preparation

The identified municipal products will be placed into the appropriate sample containers as required by the laboratory. Due to the size of some of the original packaging it is not practical to send the samples to the laboratory in the original product packaging.

The laboratory will provide sample containers from a commercial supplier. All sample containers will be new and pre-cleaned by the supplier. In addition, the laboratory will provide sample labels for each bottle.

The general collection procedures for municipal product sampling are as follows:

1. Clean all sampling equipment prior to sample collection according to the procedures described in Section 6.2.
2. Don appropriate personal protective equipment (as required by the Health and Safety Plan).
3. Don clean disposable nontalc nitrile gloves, which are worn at all times when handling sampling equipment and sample containers.
4. Record pertinent data on the appropriate sampling log sheet. The sampling log sheet is included in Appendix A.
5. Label all sample containers with the date, time, sampling personnel, and other requested information. An example of a sample bottle label is provided in Appendix A.
6. For liquid, viscous liquid and gel samples, carefully remove the desired, representative sample of the municipal product from its original container directly into the sample container, if possible. If this is not possible, remove the product with a precleaned stainless steel spatula, labspoon or equivalent. Place the sample in the appropriate sample bottle.
7. Solid samples, such as dried paint, will be scraped from the surface and placed in 4 oz. jars. Three to five grams of sample is required.
8. A minimum of 10 inches of pipe is required for the PVC pipe sample. The sample should be wrapped in aluminum foil and placed in a plastic bag for shipment to the laboratory.
9. Paints, such as utility locate paint, which are used as a spray paint will be submitted to the laboratory in the spray can. The can should be placed in a plastic bag for shipment to the laboratory.
10. Record sample collection information on the sampling log sheet and store the samples in an iced cooler as described in Section 6.3.

11. Handle, pack, and ship samples according to the procedures in Section 6.3, including the completion of a Chain of Custody (COC) Form for each cooler containing sample bottles that are shipped to a laboratory for analyses (see Appendix A for an example COC form).

The sampling equipment required for the municipal product sampling is included in Table 8.

Table 8. Sampling equipment list

Equipment	
Nitrile gloves	Alconox or Liquinox (cleaning agent)
Lab spatula	Scrub brush
Aluminum foil (to wrap cleaned tools)	Absorbent pad
Chem-wipes (to dry cleaned tools)	Coolers with ice
Stainless steel bowl for cleaning	QAPP
Sample bottles	HASP
Sample log sheets	Labels
Pens and pencils	Chain of Custody Forms

6.2 Equipment Decontamination

If sampling equipment is to be reused for more than one sample, they must be cleaned prior to collecting the next sample, according to the following procedure.

1. Place sufficient absorbent pads on a flat surface.
2. On the pads, place strips of aluminum foil that will be used to wrap the utensils used during the sample preparation. The aluminum foil strips must be large enough to encapsulate the items being cleaned. It is recommended that care be taken with the strips to prevent any potential contamination. For example, only wrap the utensils in the side of the strips that have not come in contact with the absorbent pads.
3. Place appropriate amount of cleaning solution into a clean metal bowl.
4. Put on nitrile gloves.
5. Clean only one utensil at a time.
6. Using a scrubber, clean the utensil with cleaning solution. It is recommended that the cleaning take place so that the cleaning solution does not drip back into the original bowl. Clean until all the material has been removed.
7. Using de-ionized water, rinse the utensil three times or with sufficient water to remove all the cleaning solution.
8. Using a chem-wipe, dry the utensil. Use only wipes that are directly from the box and cannot have been contaminated. Dispose of the wipe once the item has been dried.
9. Rinse the utensil with a cleaning solvent such as acetone or a acetone then hexane rinse and then allow to air dry.
10. Using a prepared strip of aluminum foil, wrap the tool in foil. Make sure that all surfaces are covered by foil (shiny side out) and that only the internal, clean site of the foil comes in contact with the tool.
11. Place the cleaned utensil aside to prevent contamination from work done on other utensils.

6.3 Sample Handling and Custody

Sample handling will be the responsibility of the sampling team and will be performed using methods as specified in the QAPP, so that representative samples are collected, stored, and submitted to the laboratory for analysis. Sample containers, volumes, preservatives and holding times are summarized in Table 9. Proper sample handling and custody procedures will be employed as discussed in the following subsections of this QAPP.

Table 9. Guidelines for sample container preparation and preservation

Parameter	Matrix	Container	Volume	Preservative	Holding Time
PCB	Liquid/gel	Glass	40 ml	4°C	1 year
PCB	Solid	glass	4 oz	4°C	1 year

6.3.1 Sample Handling

Sample handling procedures are designed to ensure that the samples and the chain-of-custody forms will arrive at the laboratory intact and together.

1. All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Fill in sample label (see example label in Appendix A). Use indelible waterproof marking pen (do not use colored ink) and include:
    - Sample identification code – will include: Product ID number-collection date (MMDDYY)-collection time (military). The product ID number is included in Tables 5, 6 and 7. For example, Product 001 collected on August 9, 2014 at 2:15PM will have a sample identification code number of "001-080914-1415".
        - Replicate samples will be labeled with a sample ID of "REPLICATE X". A blank line will be placed in the location, date and time boxes of the sample label. The replicate number in the replicate sample ID will be assigned in the field and recorded on the sample log sheet.
        - Equipment blanks will be labeled with a sample ID of "BLANK X". The location, date and time will be written on the sample label.
    - Sample type (e.g., liquid, gel, solid);
    - Analysis required;
    - Date sampled;
    - Time sampled;
    - Name or initials of person who collected the sample;
    - Mode of collection (composite or grab);
2. Check the caps on the sample containers so that they are snugly sealed.
3. Cover the label with clear packing tape to secure the label, if necessary.
4. Place sample bottle in a clean Ziploc plastic bag.
5. Samples may be temporarily stored in the RPWRF laboratory refrigerator at a maximum temperature of 4 degrees Celsius if needed for batch shipping purposes. Samples will not be stored for longer than 30 days. Samples may not be stored in a refrigerator used for food storage.
6. Samples will be placed in coolers for shipping with ice to maintain a maximum temperature of 4 degrees Celsius.

6.3.2 Field Sample Custody

The objective of field sample custody is to assure that samples are traceable and are not tampered with between sample collection and receipt by the analytical laboratory. A person will have custody of a sample when:

The person is one of the authorized personnel;

The sample is in their physical possession;

The sample is in their view after being in their possession;

The sample is in their personal possession and secured to prevent tampering; and

The sample is in a restricted area accessible only to authorized personnel.

Field custody documentation will consist of both sample log sheet and chain of custody forms.

Chain-of-Custody Forms. Completed chain-of-custody forms will be required for all samples to be analyzed. Chain-of-custody forms will be filled-out by the sampling staff during the sample collection events. The chain-of-custody form will contain the sample information:

Unique identification number;

Sample date and time;

Sample matrix;

Analyses required.

The original chain-of-custody form will accompany the samples to the laboratory. Copies of the chain-of-custody form will be made prior to shipment for separate field documentation. The chain-of-custody forms will remain with the samples at all times. The samples and signed chain-of-custody form will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., Federal Express or United Parcel Service) or to the laboratory.

Sample Packing and Shipping Requirements. Sample packaging and shipping procedures are designed to ensure that the samples and the chain-of-custody forms will arrive at the laboratory intact and together. Samples will be properly packaged for shipment according to the procedure provided below:

1. Using packaging tape, secure the outside and inside the drain plug at the bottom of the cooler that is used for sample transport.
2. Wrap each container in bubble wrap.
3. Place the sealed container upright in the cooler.
4. Place additional cushioning material around the sides of each sample container as needed.
5. Place ice or blue ice on top of sample containers. Do not pack ice so tightly that it may prevent the addition of sufficient cushioning material. Ensure that bottle caps will not be submerged in water if ice melts. Ice may also be placed in gallon Ziploc bags before placing in the cooler.
6. Fill the remaining space in the cooler with cushioning material if the coolers are being shipped.
7. Place the chain-of-custody forms in a large Ziploc type bag and tape the forms to the inside of the cooler lid.
8. Close the cooler lid and fasten with packaging tape.
9. Wrap strapping or packaging tape around both ends of the cooler at least twice.
10. Place custody seal (see Appendix A) over front right and back left of the cooler lid and cover with clear plastic tape.

All shipments will be accompanied by the chain-of-custody form identifying the contents. It is preferred that a separate chain-of-custody form be completed for and placed in each shipping container. The original form will accompany the shipment and copies will be retained by the sampler for the sampling records.

If sample containers are sent by common carrier (i.e., by Federal Express or United Parcel Service), the carrier need not sign the chain-of-custody form. In such cases, the chain-of-custody form should be sealed inside the sample container. The bill of lading (i.e., Federal Express label) serves as the custody documentation for the shipment so long as the container remains unopened until arrival at the laboratory. Copies of the bill of lading should be retained as part of the permanent documentation of the project.

6.3.3 Laboratory Sample Custody

Each laboratory will manage sample custody in accordance with the laboratory's procedures. Sample custody will also be consistent with the guidelines set forth in this section of the QAPP.

Each laboratory must have written standard operating procedures for sample custody including:

Sample receipt and maintenance of custody;

Sample storage; and

Sample tracking.

In addition, each laboratory shall have written SOPs for laboratory safety, cleaning of analytical glass ware, and traceability of standards used in sample analysis QA/QC.

An SOP is defined as a written narrative step-wise description of laboratory operating procedures including examples of laboratory documentation. The SOPs must accurately describe the actual procedures used in the laboratory, and copies of the written SOPs shall be available to the appropriate laboratory personnel. These procedures are necessary to ensure that analytical data produced are acceptable for use. The laboratory SOPs shall provide mechanisms and documentation to meet the specification of the following sections.

Sample Receipt and Maintenance of Custody. The laboratory shall have a designated sample custodian responsible for receipt of samples and have written SOPs describing duties and responsibilities.

Each laboratory shall have written SOPs for receiving and logging in of the samples. The procedures shall include but not be limited to documenting the following information:

Presence or absence of chain-of-custody forms;

Presence or absence of bills of lading;

Presence or absence of custody seals on shipping and/or sample containers and their conditions;

Presence or absence of sample labels;

Sample label identification numbers if not recorded on the chain-of-custody record(s) or packing list(s);

Condition of the shipping container;

Condition of the sample bottles;

Verification of agreement or non-agreement of information on receiving documents; and

Resolution of problems or discrepancies.

Sample Storage. After samples are received, they are placed in secure storage where they are maintained at 4 degrees Celsius.

The laboratory shall have written SOPs for maintenance of the security of samples after log-in and shall demonstrate security of the sample storage and laboratory areas. The SOPs shall specifically include

descriptions of all storage areas for samples in the laboratory, and steps taken to prevent sample contamination. Only authorized personnel should have access or keys to secure storage areas.

Sample Tracking. The laboratory shall have written SOPs for tracking the work performed on any particular sample. Documentation of sample receipt, sample storage, sample transfers, sample preparations, sample analyses, instrument calibration and other QA/QC activities shall be performed.

6.3.4 Laboratory Chain of Custody Procedures

Use of the chain-of-custody form will terminate when laboratory personnel receive the samples and sign the form. The laboratory custodian will open the sample coolers and carefully check the contents for evidence of leakage and to verify that samples were kept on ice. The laboratory will then verify that all information on the sample container label is correct and consistent with the chain-of-custody form. Any discrepancy between the sample bottle and the chain-of-custody form, any leaking sample containers, or any other abnormal situation will be reported to the Laboratory Technical Director/Project Manager. The Laboratory Project Manager will inform the Project Manager of any such problem, and corrective actions will be discussed and implemented.

7 Measurement Procedures

This section details the aspects of the analytical requirements, ensuring that appropriate analytical methods are employed. Desired reporting limits, expected concentrations, and analytical methods for the PCBs in Municipal Products project are shown in Table 10.

The laboratory will provide sample containers from a commercial supplier. All sample containers will be new and pre-cleaned by the supplier. In addition, the laboratory will provide sample labels for each bottle.

Table 10. Laboratory Methods and Detection Limit

Parameter	Sample Matrix	Sample Number	Detection Limit*	Expected Concentrations	Analytical Method	Laboratory
PCB congeners	Solid/Liquid/Gel	36	0.02 to 0.1 ppb	1-200 ppb	EPA 1668C	Pacific Rim

*Detection limit is determined as 2.5 times the signal to noise ratio, as per Method 1668C.

8 Quality Control

Analytical quality control will be performed in accordance with the specified analytical methods and as discussed under the Quality Objectives Section of this QAPP.

8.1 Field Sampling Quality Control

Field sampling QC consists of collecting field QC samples to help evaluate conditions resulting from the preparation of samples for this project. Field QC is intended to support the following data quality goals:

Combined sampling and analysis technique variability, as well as sample heterogeneity – assessed using field replicates.

The Project Laboratory Manager or Project Quality Assurance Officer will inform the Project Manager in writing of any quality control check issues and to discuss corrective actions. All quality control documents will be contained in a file for each monitored event.

Field Replicate Samples – Field replicate samples will be collected to evaluate the precision of sample collection/preparation through analysis. Field replicates will be collected for designated products by filling two distinct sample containers for analysis. Field replicates will be collected for a random set of products. Field replicate samples will be preserved, packaged, and sealed in the same manner described for the product samples. A separate sample number will be assigned to each replicate (REPLICATE X). The samples will be submitted as "blind" samples to the laboratory for analysis.

Field replicates will be collected for each analytical parameter at a minimum frequency of 10%. The replicate samples will be collected for product ID numbers 001, 003, 008 and 018. If the acceptance criteria are exceeded, sample preparation and handling procedures will be evaluated, and problems corrected through greater attention to detail, additional training, revised techniques, or whatever appears to be appropriate to correct the problem.

Equipment Blanks – Equipment blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sample collection due to exposure from ambient conditions or contaminated equipment. Equipment blank samples will be obtained by pouring deionized water over or through the sampling equipment and then poured into the sample container. Equipment blanks will be collected at a frequency of 5% of the number of samples that require equipment during the sampling process (1 equipment blank). The equipment blank will be preserved, packaged, and sealed in the same manner described for the product samples. A separate sample number will be assigned to the blank. If target analytes are found in the equipment blanks, sampling and handling procedures will be reevaluated and corrective actions taken. These may consist of, but are not limited to, training of personnel, discussions with the laboratory, invalidation of results, greater attention to detail during the next sampling event, or other procedures considered appropriate.

Table 11. Monitoring Program Sample Numbers

Parameter	Number of Product Samples	Number of Field Replicate Samples	Number of Equipment Blanks
PCB Congeners	36	4	1

8.2 Laboratory Analysis Quality Control

Laboratory QC is the responsibility of the laboratory personnel and QA/QC departments of the laboratory. The laboratory's QA Manual details the QA/QC procedures it follows. The following elements are part of standard laboratory quality control practices:

- Analysis of method blanks
- Analysis of laboratory control samples
- Instrument calibration (including initial calibration, calibration blanks, and calibration verification)
- Analysis of duplicates

The data quality objectives for the laboratory (including frequency, QC acceptance limits, and corrective actions if the acceptance limits are exceeded) are detailed in this QAPP. Any excursions from these objectives must be documented by the laboratory and reported to the Project Manager/Project QAO.

Method Blanks – A method blank is an analyte-free matrix, analyzed as a normal sample by the laboratory using normal sample preparation and analytical procedures. A method blank is used for monitoring and documenting bias due to background contamination in the analytical environment. Method blanks can be used to estimate within- batch variability of the measurement system. Method blanks will be analyzed at a frequency of one per sample batch (or group of up to 20 samples analyzed in sequence using the same method). Corrective actions associated with exceeding acceptable method blank concentrations include isolating the source of contamination and re-digesting and/or re-analyzing the associated samples. Blank contamination will be noted in the laboratory reports, but sample results will not be corrected for blank contamination. Corrective actions will be documented in the laboratory report's narrative statement.

Laboratory Control Samples – Laboratory control samples (LCS) are laboratory-generated samples analyzed as a normal sample by the laboratory using normal sample preparation and analytical procedures. An LCS is used to monitor the day-to-day performance (accuracy) of routine analytical methods. An LCS is an aliquot of clean water spiked with analytes of known concentrations corresponding to the analytical method. The LCS is used to verify that the laboratory can perform the analysis on a clean matrix within QC acceptance limits. Results are expressed as percent recovery of the known amount of the spiked analytical parameter.

One LCS is analyzed per sample batch. Acceptance criteria (control limits) for the LCS are defined by the laboratory and summarized in Table 4. In general, the LCS acceptance criteria recovery range is 85 to 115 percent of the known amount of the spiked analytical parameter. Corrective action, consisting of a rerunning of all samples in the affected batch, will be performed if LCS recoveries fall outside of control limits. Such problems will be documented in the laboratory report's narrative statement.

Laboratory Duplicates – A laboratory duplicate is a laboratory-generated split sample used to document the precision of the analytical method. Results are expressed as relative percent difference between the laboratory duplicate pair.

One laboratory duplicate will be run for each laboratory batch or every 20 samples, whichever is more frequent. Acceptance criteria for laboratory duplicates are specified in the laboratory QA Manual and SAPs and are summarized in Table 4. If laboratory duplicates exceed criteria, the corrective action will be to repeat the analyses. If results remain unacceptable, the batch analyses will be rerun.

PCB: Labeled Compound, Cleanup, Internal and Injection Standards - Similar to surrogate spikes, these standards are 13C isotopes which are spiked into all field and laboratory samples prior to different points in

the analytical process (extraction, cleanup and injection). 13C congener isotopes are added prior to extraction. These homologs are used for the purpose of quantifying target compounds. Cleanup 13C homologs are added prior to cleanup of samples for the purpose of monitoring their recoveries through the cleanup processes, for internal diagnostics only. The third 13C homologs (recovery standards) are added just prior to sample injection to monitor the recoveries of the pre-extraction homologs to insure they meet method criteria. Difficulties with the analytical method or sample matrix affect the recovery of these standards. If method criteria are not met the laboratory should take appropriate corrective action including re-extraction if necessary.

The laboratory will provide a summary of all QA/QC results. The QA/QC summary will be reviewed by the Laboratory Technical Director and the QA Manager to assess the adequacy of the quality control checks and to identify any potential problems. Table 11 summarizes the laboratory quality control check frequencies.

Table 12. Laboratory Quality Control Checks

Parameter	Laboratory Control Sample	Laboratory Duplicates	Method Blanks	Surrogate Recovery
PCB congeners	1/batch	1/batch	1/batch	Every Sample

Batch: maximum of 20 samples

9 Data Management Procedures

Data generated through field and laboratory activities will be used to determine PCB concentrations in municipal products, as described in previous sections of this QAPP. The Project Manager will be responsible for organization and oversight of data generation, distribution, processing and storage so that the data will be documented, accessible and secure for the foreseeable time period of its use. The Laboratory Technical Director has the same responsibility for laboratory data and information.

Instrumentation used to generate, process and store data will be configured, maintained and operated in accordance with manufacturer recommendations and accepted industry standards. Generated raw data will be stored in formats compatible with the method or instrument of generation. Processed data will be stored in text files, Microsoft Excel spreadsheets or Access databases compatible with version 2007. Data reported in paper format will be stored in the project files. Following all data validation and verification procedures the City of Spokane will enter the data into a database.

9.1 Field Data and Information Management

Field data reporting shall be conducted by the sampling staff principally through the transmission of sample log sheets containing documentation of sampling activities. Sample log sheets will be turned over to the Project Manager following the sampling events. An example of a sample log sheet is included in Appendix A.

9.1.1 Sample Log Sheet

Sample log sheets will serve as a daily record of events and observation during sampling activities. All information pertinent to sampling activities will be recorded on the sample log sheet. Personal computers may also be used to record the sampling information. Sample log sheets will be maintained by sampling staff at all times documenting activities and conditions. Sample log sheets will be turned in to the Project Manager following each sample collection day. Copies of all sample log sheets will be made following each sampling event and maintained in the QA/QC project file.

Entries on the sample log sheet will include:

- Name(s) of field crew
- Description of sample
    - Product type
    - Product description
    - Specific brand/type
    - Manufacture date (if available)
    - Country of manufacture (if available)
- Sample location
- Number and volume of samples taken
- Date and time of collection
- Sample identification numbers
- Sampling method
- Date and time of shipment
- Shipment method
- Field observations

9.1.2 Labels

The sampler will label samples in a clear and precise way for proper identification and for tracking in the laboratory. The samples will have pre-assigned, identifiable and unique numbers. At a minimum, the sample labels will contain the following information.

- Unique sample number,
- Sample description (e.g. grab, composite),
- Date and time of collection,
- Initials/signature of sampler, and
- Analytical parameters.

9.1.3 Field Quality Control Sample Records

Field QC samples (replicates/equipment blanks) will be labeled as such in the sample log sheet. They will be given unique sample identification (REPLICATE/BLANK) and will be submitted "blind" to the laboratory. The frequency of the QC sample collection will also be recorded in the sample log sheet.

9.2 Laboratory Data and Information Management

The reporting of laboratory data will begin after the Laboratory Technical Director or designee has concluded the verification review. The contract laboratory will prepare and submit full analytical and QC reports to the Project Manager that will include the following, as appropriate.

- Case narrative, including a statement of the conditions that samples were received, description of any deviation from standard procedures, explanation of any data qualifiers used, and identification of any problems encountered during analysis.
- Computer generated report form containing all sample results

  a hard copy version of the report

  an electronic version of the report on CD
- Hard copy QC summary report for each parameter by batch including the results of replicates, controls, dilution blanks, method blanks, verification tests, etc.
- Copies of all chain-of-custody forms.

Copies of all laboratory bench sheets will be kept on file and made available for review, for a minimum of seven years.

Following receipt of laboratory data by the Project Manager, the data will be reviewed and validated by the Project Quality Assurance Officer (QAO) following the procedures outlined in Section 11.

9.3 Electronic Data Management

All data collected during the course of the study will be entered into the City of Spokane's database, which will be made available for use by other entities upon request. The Project Manager will manage and maintain the database. Ecology's EIM database is not applicable because there is no location data for these samples. An Ecology product sampling database exists, and uploading external (e.g. City of Spokane) data is under consideration.

All electronic files will be backed up on a regular basis. Validated and quality assured data will be made available for upload to a City of Spokane database.

10 Audits and Reports

10.1 Audits

Pacific Rim Laboratories is accredited by the State of Washington for analysis of the target PCBs by Method 1668C. As part of the accreditation process, the State of Washington will perform on-site audits of the laboratories staff, facilities, and analytical capabilities. The laboratory's quality system, test methods, records and reports will also be evaluated as part of the accreditation process. Pacific Rim Laboratories must participate in performance and system audits of their routine procedures. Results of these audits must be made available on request.

10.2 Reports

A final report detailing the findings of the study will be completed by the Project Manager. The final report will include:

- Summary of experimental design.
- Any deviations from the QAPP and sample preparation, QA/QC requirements, etc.
- Assessment of product test results from municipal products for PCBs.
- Determination of what levels of specific PCB congeners are found in municipal products, including homologue patterns.
- Qualitative data on specific products used by municipalities in Washington State.
- Appendices that include final SOPs and tables showing results of laboratory analyses.

A draft report will be submitted to Ecology for review. The final report will be distributed to Ecology, partnering jurisdictions, and the Spokane River Regional Toxics Task Force, as well as uploaded to the City's website.

11 Data Verification and Validation

The purpose of data verification and validation is to determine if the data meet the project's MQOs (validation) and to evaluate the data against the method, procedural and/or contractual requirements (verification). Data validation, verification, and usability assessment will be conducted as outlined in this QAPP.

The data generated from the sampling program will be subjected to a multi-tiered review process described below. This process includes:

- A review of the data at the bench and field levels;
- A secondary review of analytical results within the laboratory by the Laboratory QA Manager to verify the data against method requirements;
- A screening level review of the verified data by the QAO for reasonableness and to identify obvious data anomalies;
- A validation by an objective third party; and finally,
- An assessment of the data by project team members for its usability in the project as described in Section 12 of this QAPP.

11.1 Data Review, Verification and Validation

All environmental measurement data will be subjected to quality control checks before being utilized in the interpretive reporting. A data generation system that incorporates reviews at several steps in the process is designed to protect the integrity of the data and reduce the number of data that do not meet the MQOs or the project goals. This section describes the requirements of each review step that will be used in this project.

11.2 Data Verification Requirements

The definition of data verification, as described in the EPA's "Guidance on Environmental Data Verification and Data Validation" (EPA QA/G-8) is:

"…the process of evaluating the completeness, correctness, and conformance/compliance of a specific dataset against the method, procedural or contractual requirements."

Data verification will occur at the field and laboratory level as described in this section.

11.2.1 Field Activities Data Verification

The Project Manager will be responsible for ensuring that samples are collected and handled in accordance with the procedures specified in the QAPP. Sample collection verification will include confirming that the samples were processed with the proper equipment. Sample handling verification will include confirming that the samples were stored in the appropriate containers (see Table 9), that the samples were stored at the proper temperature during transport from the field to the laboratory, and that all of the appropriate information is logged on the chain-of-custody records.

11.2.2 Lab Activities Data Verification

The Laboratory QA Manager will be responsible for verification of laboratory-generated data, although the laboratory Standard Analytical Procedures for each method require some components of the verification to also be conducted at the bench level. Laboratory verification will include assessing that the procedures used to generate the data are consistent with the method requirements and that the QA/QC requirements for the method are met. Examples of method requirements include verifying the calibration and data reduction procedures. Once the data have been verified and approved by the laboratory, they will be released to the City of Spokane.

11.3 Data Validation Requirements

The purpose of data validation, as described in the EPA's "Guidance on Environmental Data Verification and Data Validation" (EPA QA/G-8) is:

> *"…an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance to determine the analytical quality of a specific data set."*

According to Ecology guidance, data validation is the responsibility of the project manager or a qualified specialist. The project QAO will conduct the data validation.

The first requirement in this project's data validation is to inspect the data verification and review records to ensure that no oversights were made during that process. The second requirement of the data validation is to evaluate the data against the project's MQOs. The project-specific MQOs are presented in Section 4. If data do not meet one or more of the MQOs, the data validation process will include an investigation into causes and an assessment of the impact of the noncompliant data on project objectives. The third requirement of the data validation is to evaluate the data in the context of the project's overall objectives, which are described in Section 2. The fourth requirement of the data validation is to communicate the data validation results to the rest of the project team.

11.4 Verification and Validation Methods (D.2)

All environmental measurement data and samples prepared by project staff will be subjected to quality control prior to being entered into the project database. This is a multi-step process where the Laboratory QA Manager will have primary responsibility for verifying the data and a third party, who is not involved in the data collection or analysis, conducts the data validation. These steps are described in more detail in the following sections.

11.4.1 Data Verification

This section describes the procedures that will be utilized in this project for verifying the data against method, procedural and/or contractual requirements.

11.4.1.a Field Activities Data Verification

Sampling staff will verify the completion of their sample log sheets and chain-of-custody forms. At the completion of each sampling event, the Project Manager will review all sample log sheets and chain-of-custody forms for accuracy and completeness. The Project Manager will also verify that monitoring QA objectives for all accuracy, precision, completeness, and adherence to the required collection techniques are being met.

11.4.1.b Laboratory Analytical Results Verification

Individual analysts will verify the completion of the appropriate analytical test and required bench sheets. The Laboratory Technical Director or designee will review calculations and inspect laboratory bench sheets and log books daily to verify their accuracy, completeness, and adherence to the specified analytical method protocols. Calibration and QC data will be examined daily by the individual analyst. The Laboratory Technical Director or designee will verify that all instrument systems are under control and that QA objectives for accuracy, precision, completeness, and adherence to the required detection limits are being met.

A summary of all QA/QC results and any non-conformance issues will be included in the laboratory deliverable to the Project Manager.

11.4.2 Data Validation

This section describes the process that will be used to validate the data generated for this project. The first requirement in this project's data validation is to inspect the data, verification and review records to ensure that no oversights were made during that process. A complete set of field and laboratory information will be provided to the data validator for this task. The data management components described in Section 9 will be sufficient for this purpose.

The primary objective of the data validation in this project is to evaluate the data against the MQOs presented in Section 4. These MQOs include criteria for accuracy, precision, completeness, representativeness, comparability and compliance with required detection limits. The data management components described in Section 9 will provide the necessary information to make this evaluation.

The following must be checked as part of the measurement data and analytical data validation activities.

1. sample collection/preparation
2. sample custody
3. laboratory analytical results and case narrative
4. data reviews
5. quality control data

The QAO will conduct a systematic review of the data for compliance with the established quality control criteria based on replicate, spiked, control, and blank data results provided by the laboratory. In addition, quality assurance evaluations of data accuracy, precision, and completeness will be performed on the laboratory analytical results. The data validation qualifiers listed in Table 12 will be used when validating the data.

Table 13. Data validation qualifiers

Qualifier	Definition
B	The sample concentration is <3x concentration found in the blank.
U	The analyte was not detected in the sample at the estimated detection limit.
J	The reported result is an estimate. The value is less than the minimum calibration level but greater than the estimated detection limit.
R	The data are unusable (note: analyte may or may not be present)
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

All qualified data will be reported with validation qualifiers.

If quality control checks or objectives were not met, an investigation of the non-conformance will be initiated by the QAO with the project team personnel, including the Laboratory QA Manager and the Project Manager. The non-conformance will be documented and the affected data set will be flagged appropriately, identifying any limitations.

The data validation results will be communicated to the project team in the form of a summary table that lists the validation tasks performed and the associated results and conclusions. If the validated dataset includes non-compliant data, this data will be addressed in a memo that accompanies the summary table. Data qualifiers assigned to the data during validation will be maintained in the project database to ensure communication of validation results with current and future data users.

12
Data Quality (Usability) Assessment

The Project Manager will assess the quality of the data based on case narratives and data packages. Laboratory QC tests will be examined to determine if the laboratory met the MQOs for method blanks, LCS and duplicate samples. Reporting limits will be examined to ensure that the contract-defined reporting limit was met. This data evaluation will determine if the sampling design achieved project objectives and the required data quality. Data will either be accepted, accepted with additional qualification, or rejected and re-analysis considered. Data quality and usability will be discussed in the final report. Data will be evaluated for false negatives or false positives for any impact they may have upon the results of the study.

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APPENDIX A

Example Sample Documentation

Sample Bottle Label

Client/Source:	☐ **Grab** ☐ **Composite**
Site Name:	**Date:**
Sample #	**Time:**
Analysis:	**Preservatives:**
	Collected by:

Sample Custody Seal Label

Sealed by: _____
Date: _____Time: _____

Pacific Rim Laboratories Inc.

CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

Pacific Rim Laboratories Inc. #103, 19575 - 55A Avenue, Surrey, BC V3S 8P8 Tel: 604-532-8711 Fax: 604-532-8712

COMPANY:		CONTACT:	
Address:		PHONE:	
Date:		EMAIL:	

SAMPLE ID	PRL ID	DATE SAMPLED	SAMPLE MATRIX	NUMBER	DIOXIN	PCB -	PCB - 209 congener	PAH	PBDE	TBT	Nonylphenol		Date Requested	COMMENTS

Sampler's Signature	Relinquished by:	Company	Date	Time	Received by:	
Comments:	Method of Shipment	Waybill No.:	Rec'd for PRL:		Date	Time
	Shipment Condition	Temp.:	Cooler Opened By:			

EXAMPLE SAMPLE LOG SHEET

GENERAL INFORMATION			
Date:			
Sampler(s) (name & title):			
Sampler Organization:			
Product User Contact (name & title):			
SAMPLE DETAIL			
Product Type:			
Description of Product:			
Brand/Type:			
Sample Location:			
Manufacture Date:			
Country of Manufacture:			
SAMPLE COLLECTION INFORMATION			
Sample ID:			
Sample ID Number (if applicable):			
QC Information (if applicable, replicate/blank):			
Volume of Sample(s):			
Date of Collection:			
Time of Collection:			
Sample Method (grab/composite/etc.):			
Sample Media (solid/liquid/gel, etc.):			
Analytical Parameter(s):			
SAMPLE SHIPMENT INFORMATION			
Date of Shipment:			
Time of Shipment:			
Shipment Method: (Fed Ex/UPS/etc.):			
Shipment Destination (Lab Name/Other):			
FIELD OBSERVATIONS/NOTES			