Quality Report to Management
July 2015 – June 2018

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Purpose of This Document

The Washington State Department of Ecology (Ecology) implements a structured quality system that provides a framework for:

1. Planning, conducting, documenting, and assessing the operations that generate new environmental data or use existing environmental data.
2. Carrying out required quality assurance (QA) and quality control (QC) activities. Ecology's quality system encompasses both management and technical activities, and is fully described in the agency's EPA-approved Quality Management Plan (QMP).

Ecology's current QMP (Ecology, 2015), which is based on EPA's Requirements for Quality Management Plans (EPA, 2001; EPA 2006), requires the Quality Assurance Officer (QAO) to produce a Quality Report to Management (QRM) every three years. The QRM evaluates the agency's quality system, identifies issues that need to be addressed, and makes recommendations for quality system improvements. This report to management documents various aspects of the current quality system, as well as QA/QC-related activities from July 2015 to June 2018, including:

- Development and approval of Quality Assurance Project Plans (QAPPs).
- Documentation of Standard Operating Procedures (SOPs).
- Quality system initiatives undertaken.
- Any issues associated with implementing the *Quality Management Plan*.
- Recommendations for changes to the quality system and *Quality Management Plan*.
- Reports on current quality system activities from all Ecology environmental programs.

The intended audience for this report includes Ecology's director and deputy director, Ecology's executive management team, and other interested parties.

ECOLOGY'S QUALITY SYSTEM

STRUCTURE AND ORGANIZATION

Ecology receives substantial funding from the U.S. Environmental Protection Agency (EPA). For this reason, Ecology participates in EPA's overarching quality system. Ecology also established its own quality system within Executive Policy 22-01 (Ecology, 2006). A description of this quality system is in the most recent EPA-approved QMP (Ecology, 2015).

Ecology's Director has sole authority to designate the agency's QAO, whose role is to oversee implementation of the QMP, managing and coordinating QA activities throughout the agency. The QAO works collaboratively with the program QACs to ensure a robust agency quality system. Other QAO responsibilities include:

- Leading Ecology's response to periodic EPA reviews of the agency's quality system.
- Updating the QMP every five years.
- Preparing the QRM (this document) every three years.
- Approving Quality Assurance Project Plans (QAPPs).
- Providing QA guidance to QA Coordinators (QACs) and staff.
- Acting as chief liaison for most extra-agency QA activities.[2]

The QAO reports directly to the manager of the Environmental Assessment Program (EAP) and indirectly to the Deputy Director.

Responsibility for ensuring quality within each of Ecology's environmental programs is partly delegated to program QACs. Ecology recommends that each program assign up to 0.25 FTE for QA-related activities within their respective programs. They have a range of responsibilities defined in the *Quality Management Plan*, including contributing to this document.

Ecology's Manchester Environmental Laboratory (MEL) provides in-house analysis of inorganic chemicals (e.g., nutrients and metals), organic contaminants, and microbiology parameters in many types of environmental samples. MEL plays an integral role in the quality system at Ecology. Laboratory QA practices are described in a separate *Quality Management Plan* (Ecology, 2015) and the MEL Quality Assurance Manual (Ecology, 2016). During the

[2] Ecology's National Estuary Program (NEP) Quality Coordinator also provides advice and technical assistance on QA-related matter to many external grantees funded by EPA.

reporting period, MEL maintained approximately 93 detailed Standard Operating Procedures (SOPs) listed in Appendix C. MEL's director reports to the EAP Program Manager.

The Laboratory Accreditation Unit (LAU) provides accreditation services to help establish and document laboratory proficiency for analysis and reporting of environmental data to Ecology. Accreditation requirements for data produced by and submitted to Ecology are summarized in Ecology Policy 22-02 (Ecology, 2008a). LAU maintains a procedural manual[3] (Ecology, 2010) and several SOPs that document the QA practices and procedures of the unit. The LAU supervisor reports to the Statewide Section Coordinator within EAP.

[3] https://fortress.wa.gov/ecy/publications/SummaryPages/1003048.html

Quality-Related Initiatives and Issues

2017 EPA Audit Recommendations and Responses

EPA Region 10 staff performed the fifth Quality System Review of Ecology's operations on January 23 and 25, 2017. Objectives of the review were to evaluate:

- Conformance of Ecology's quality system to its EPA-approved Quality Management Plan (QMP).
- Conformance of the Manchester Environmental Laboratory to its Quality Manual.
- Suitability and effectiveness of practices implemented by Ecology and its laboratory through the QMP and laboratory Quality Manual.

Donald Brown and Raymond Wu conducted these evaluations by reviewing more than 50 Ecology documents related to its QA program and by interviewing nine staff members. The final report, issued on April 20, described no negative findings but provided some recommendations. Ecology's associated responses follow each list of recommendations.

1. QA Training

EPA Recommendations

EPA observed that "QA/QC training does not occur on a consistent basis nor do current staffing resources allow for time to conduct training,"[4] and recommended that "QA/QC training be conducted agencywide at least on an annual basis," to:

- "Help institutionalize quality system requirements through learning."
- "Provide guidance on how to comply with quality system policies and requirements."
- "Enhance individual performance by developing proficiencies in the use of QA and QC tools and related technical skills."
- "Standardize quality systems policy throughout an organization."

Ecology Responses

- The previous QA Officer, Bill Kammin, drafted an agencywide QA training plan that identifies several target audiences and proposes topics for QA training most appropriate to each. However, the final plan will still need to address the required

[4] "EPA Order CIO 2105.0, Policy and Program Requirements for the Mandatory Agency-wide Quality System, requires all EPA organizations supporting environmental programs to identify program-specific QA and QC training needs for all levels of management and staff, and to provide resources for this training."

frequency of training and the best means of delivering the QA content to each audience. Ways to improve QA training include:

- All new staff self-certify having reviewed Ecology QA policies within a month of employment.
- Administrative staff self-certify annually having reviewed a custom PowerPoint presentation summarizing Ecology's QA system (to be developed).
- Non-technical staff (e.g., Fiscal, IT, and personnel staff, as well as organizational managers) annually self-certify having reviewed the QMP.
- Non-field technical staff (e.g., permit, site, and organizational managers) annually self-certify having reviewed the agency's QMP and QAPP guidance.
- Field and lab staff annually certify that they have reviewed the information listed above; their supervisors also certify that they are familiar with standard operating procedures necessary to conduct their work.
- All staff may elect to attend or be assigned by supervisors to attend annual QA workshops.

The current QA Officer intends to present a comprehensive plan to management for discussion and approval by the end of the year 2020.

2. Quality Assurance Coordinators (QACs)

EPA Recommendations

EPA noted, "Several of the QACs did not fully understand their responsibilities or were not performing any of the tasks as stated in the QMP."[5] The resulting recommendations were:

- "The QMP should be updated to accurately reflect the actual work that is being conducted under the QAC positions."
- "To aid in this effort, it may be worthwhile for the Agency QAO to conduct trainings or information sessions to go through the responsibilities required of the QACs."

Ecology Responses

The previous QA Officer reviewed QAC responsibilities and expectations during a quarterly meeting.

The QAO is logging suggested revisions to Ecology's QMP (e.g., the need to clarify QAC qualifications, training, and responsibilities). The QMP will be revised, approved, and published in 2020.

[5] "The division of labor of QA responsibilities in this office (EAP) is unclear," and "The QAC (in the Water Quality Program) is currently performing none of the QAC functions as described in the QMP."

3. Manual Peak Integration

EPA Recommendations

EPA found that "Procedures for allowing manual correction of raw data (e.g., manual integration) and for overriding instrument qualitative results should be documented to ensure consistency and data integrity. Currently, Ecology's Manchester Environmental Laboratory does not have a detailed documented procedure for conducting manual integration such as a standard operating procedure (SOP)." EPA recommended, "The laboratory (MEL) should establish SOPs addressing manual calculations including manual integrations."

Ecology Response

MEL drafted and later approved SOP 730127 *Proper Manual Peak Integration* (Weakland, 2017) to provide details about how laboratory analysts manually quantify instrument response (i.e., integrate the area under a response curve/trace).

4. Split Samples

EPA Recommendations

EPA observed, "Few Ecology program offices are utilizing split samples[6] despite the willingness of the Manchester Environmental Laboratory to analyze these types of QC samples." In this case, EPA recommended, "Ecology should consider the use of split samples for its programs that utilize contract laboratories."

Ecology Response

Ecology made a commitment to improve the existing split sampling process.

During the reporting period, very few programs sent out split samples for analysis. This was because of limited funding during the last biennium as well as lack of understanding of procedures and requirements. The QAO plans to address this in the upcoming 2019–2021 biennium.

[6] Split samples are equivalent portions of the same sample that are analyzed separately, usually by different laboratories. They are an invaluable tool for evaluating laboratory data from contracted projects. As such, they are a key element of Ecology's strategy for complying with EPA's *Policy to Assure Competency of Organizations Generating Environmental Measurement Data Under Agency-Funded Assistance Agreements* (Number FEM-2012-02).

Ecology Quality Assurance Website

In June 2006, Ecology created a quality assurance website intended to make QA-related policies, the agency's QMP, QA guidance, SOPs, and other important quality information accessible to the public. This website enabled Ecology staff, as well as grantees and loan recipients, to download a QAPP template, review a QAPP checklist, and access QAPP-related guidance.

From 2011–2013, after assuming QA oversight of state-directed projects funded by EPA's National Estuary Program (NEP), Ecology's QA website expanded to include quality information relevant to NEP grant recipients (e.g., QA process diagram and QAPP waiver form). In late 2017, the QA website underwent revisions to be consistent with an agencywide web upgrade.

Currently, Ecology's public QA website contains or has links to:

- EPA's QA requirements and guidance documents.
- Ecology's Quality Management Plans and Quality Reports to Management.
- Information for grantees (e.g., QA-related templates, checklists, forms, and SOPs).

Additional QA resources are available to Ecology staff via an internal SharePoint site:

- EAP procedures and guidance.
- QAPP template and review checklist.
- MEL Lab Manual, Users Guide.
- MEL SOPs (available on the MEL SharePoint site).
- Approximately 100 EAP SOPs for field methods and other activities.
- Approximately 30 other SOPs prepared and used by staff in other Ecology programs (Ecology field, field analytical, stormwater, spills-related, and lab accreditation).
- QA training materials.
- Miscellaneous other information.

Quality Assurance Project Plans and SOPs

QAPPs

Historically, Ecology's QAPP template was developed primarily for use by EAP staff. Ecology began requiring recipients of certain National Estuary Program (NEP) grants to use the template in late 2011. In 2016, the QAO and NEP Quality Coordinator used staff input to revise the QAPP template for use by all Ecology program staff as well as external parties. The new template featured instructions for internal and external authors, numbered headers, sections tailored to modeling projects, guidance on what content to include in each section, and a QAPP review checklist.

Currently, EAP staff, Water Quality Program grant recipients, and NEP grant recipients use the 2016 template to prepare QAPPs. The QAO strongly recommends all other Ecology staff do so too. Many external organizations have used Ecology's 2016 QAPP template (or earlier versions of it). The QAO envisions making some limited revisions to the template in 2019.

QAPPs, whether prepared by Ecology staff or external grant recipients, must be completed and approved prior to beginning work. The QAO can make an exception for a project that responds to a legitimate emergency or that assesses potential health risk (EPA QA/R-5). In these cases, both the QAO and EAP Program Manager sign an "Approval to Begin Work" form. The QAO recommends all programs adapt a similar form to ensure that project work doesn't commence before sampling.

In rare cases, the QAO may also grant 'Approval to Begin Work' for field activities if there is true urgency, and the detailed field activities are sufficiently documented in advance. However, the form has occasionally been misused as follows:

- Finalization of the QAPP ceased, and the project was completed without the QAPP ever having been approved.
- Work proceeded, but the QAPP contained QA or other issues that were never resolved, so approval could not be granted.

The QAO is currently addressing these misuses of the form.

Projects with multiple objectives, multiple participants or stakeholders, a complex study design, or other technical challenges can be at risk for missing QAPP approval deadlines. This is because it is difficult to incorporate multiple sets of comments, complete and approve the QAPP, and also meet field-sampling constraints. However, these projects do not fit into the categories of emergency, health risk, or true field urgency. If such projects proceed without an approved QAPP, the QAO will likely issue a Stop Work Order.

SOPs

Ecology began developing standard operating procedures (SOPs) in 2006. The QAO introduced "SOP for Field SOPs" to EAP headquarters (HQ) staff. The EAP Program Manager also approved the procedure for documenting SOP development, revision, and archiving.

Ecology currently has approximately 240 SOPs that have been approved; most are currently certified, and many are available on the QA website. Most of Ecology's SOPs are from the Environmental Assessment Program (including MEL). The following programs also have program-specific SOPs: Air Quality, Spills, Hazardous Waste and Toxics Reduction, Shorelands and Environmental Assistance, Solid Waste Management, Toxics Cleanup, Water Quality, and Water Resources (see Table 1).

Table 1. Number of SOPs from each Ecology program.

Program	Number of SOPs
Air Quality	13
Environmental Assessment Program	101
Environmental Assessment Program –Laboratory Accreditation Unit	3
Environmental Assessment Program –Manchester Environmental Lab	93
Hazardous Waste and Toxic Reduction	2
Nuclear Waste Program	2
Shorelands and Environmental Assistance Program and Office of Chehalis Basin	3
Spill Prevention, Preparedness, and Response Program	7
Toxics Cleanup Program	1
Solid Waste Management	1
Water Quality Program	4
Water Resources and Office of Columbia River	9

Formal SOP Recertification Process

Ecology's QA Officer recertifies SOPs on a three-year cycle, alerting SOP authors in advance of due dates for recertification. The current focus is on tracking and recertifying EAP and MEL SOPs. Starting in 2019, the QA Officer will place more emphasis doing the same for SOPs developed and maintained by other programs.

EPA Policy on Laboratory and Field Competency

A major focus of the QAO during the next few years will be to institutionalize Ecology programs and procedures that fully address EPA's Competency Policy (EPA, 2011; EPA 2012b).

Currently, Ecology's agency accreditation program ensures competency of staff working in laboratories that submit environmental data to the agency. In addition, some organizational groups within Ecology conduct field training and/or oversight designed to ensure competency of staff that measure field conditions and collect field samples. Other

organizational groups that conduct fieldwork have no such assurances in place. For many internal and external projects and activities, the only indications of field competency are claims made in Ecology-approved QAPPs about staff experience, training, and adherence to field SOPs.

Ecology currently lacks a comprehensive field certification program designed to demonstrate competency of all its field staff, let alone field staff working for external organizations that submit environmental data to Ecology as contract or grant deliverables. For this reason, the QA Officer plans to:

- Evaluate elements of the limited field certification and training programs that do exist.
- Prepare a memorandum summarizing at least three feasible options for a comprehensive field method certification program plan.

The memorandum will be available for management discussion during the second half of calendar year 2020.

Ecology has modified the QAPP format to include information on sampler qualifications and training. The existence of SOPs for all field data and sample-generating activities is key to demonstration of competency. Similarly, training on those documents must be recorded.

Quality Assurance Training Resources

Getting training resources to improve quality assurance continues to be an issue for the agency. Current QA staff are tasked with duties that limit the amount and frequency of QA training that can occur. Depending on the nature of the comprehensive QA training plan (to be approved next year), Ecology will likely need an additional full-time equivalent (FTE). This person would be responsible for coordinating and implementing regular QA trainings that target multiple audiences. Other related responsibilities might include applying a meaningful field certification program and conducting more audits of ongoing projects.

Independence of Ecology's Quality System from Operational Influence

As described earlier, Ecology's current QMP indicates that the agency's QAO reports directly to the EAP Program Manager and reports indirectly to the Deputy Director. The EAP Program Manager is in charge of many program elements including budgets and timelines for projects that require field measurements, collect environmental samples, and involve various laboratory analyses. External auditors have expressed some concern over potential conflict of interest; this has led to an inherent tension between QA and operations. For example, the EAP Program Manager could pressure the QAO to approve a deficient QAPP rather than delay the start of a project, or make other decisions not consistent with EPA QA requirements or guidance.

Many organizations have their QAO report directly to a top level of management to reduce potential for such conflict. Ecology QAOs (past and current) have also made this recommendation (i.e., have the QAO report directly to the Deputy Director and report indirectly to the EAP manager). This would provide a more defensible degree of separation between QA and operations. However, this recommendation has not been implemented because management perceives little potential for actual conflict. The QAO plans to address this concern by having the next QMP (2020) describe a procedure for resolving conflicts that could arise specifically due to this reporting arrangement.

Inter-Program Quality System Implementation at Ecology

Over the past three years, Ecology has taken steps to improve the consistency and uniformity of its QA system that is implemented across programs. The agency's QA Coordinators were invigorated by several new, highly qualified, members (see Appendix B). The QAO meets with this group of QACs approximately quarterly to share QA-related experiences, discuss QA topics of immediate concern, and brainstorm ways to improve consistency of QA system implementation. However, improvement still needs to occur in the areas of QAPP and SOP format and content standardization, and inter-program communication and cooperation. Ecology policies 22-01 and 22-02 need minor changes to ensure Ecology produces standardized quality assurance documents with required content.

Quality Assurance Oversight of EPA National Estuary Program Projects

This section describes the quality system Ecology is implementing to ensure good outcomes for projects funded by the EPA National Estuary Program (NEP). It summarizes activities and accomplishments as well as difficulties and solutions, and it recommends system modifications and new initiatives for the future.

Background and Quality System

In 2010, Congress appropriated funding for use over a period of approximately six years to help protect and restore the Puget Sound ecosystem.[7] EPA's model for administering the program has been to pass the majority of the funds to Lead Organizations[8] (LOs) initially and then to Strategic Initiative Leads[9] (SILs) more recently, and then track the effectiveness of its use. The LOs, in turn, developed multi-year strategies consistent with the Puget Sound Partnership's Action Agenda and near-term actions.

To address these strategies, LOs have collaboratively chosen projects and funded them through competitive grants, direct awards, and interagency agreements. These projects must comply with EPA's quality requirements (e.g., EPA, 2001a, 2001b). However, Ecology, by virtue of its EPA-approved *Quality Management Plan* (Ecology, 2010), has been delegated responsibility for implementing a centralized quality system applicable to nearly all NEP-funded activities and projects.[10]

Ecology's quality system, as it applies to NEP-funded activities, mirrors what is described in its approved *Quality Management Plan*. However, an addendum to the *Quality Management Plan* (Ecology, 2011) identifies a new NEP Quality Coordinator in Ecology's Environmental Assessment Program (EAP). The responsibilities of this position include determining whether projects will generate new environmental data or involve analyzing existing environmental

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[7] Funding over six years may exceed $190 million.

[8] The state Departments of Fish and Wildlife and Natural Resources (WDFW and WDNR) are the LOs for *Marine and Nearshore Protection and Restoration.* The state Departments of Ecology and Commerce are the LOs for *Watershed Protection and Restoration.* Ecology is the LO for *Toxics and Nutrients Prevention, Reduction and Control.* The state Departments of Health (DOH) and Ecology are the LOs for *Pathogen Prevention, Reduction, and Control.* The Puget Sound Partnership is the LO for *Managing Action Agenda Implementation and Outreach and Stewardship.* The Northwest Indian Fisheries Commission (NWIFC) is the LO for *Tribal Capacity and Implementation.*

[9] Strategic Initiative Lead organizations (SILs) include WDFW (Habitats SIL), WDOH (Pathogens SIL), and Ecology (Stormwater SIL).

[10] EPA Region 10 is responsible for ensuring that NWIFC-managed projects comply with its quality requirements.

data. For projects that meet either of these criteria, the NEP Quality Coordinator will provide guidance on drafting a QAPP; once the QAPP is submitted, the NEP Quality Coordinator will review and recommend Ecology's QA Officer approve the QAPP. For projects that do not generate new data or analyze existing data, the NEP Quality Coordinator will facilitate approval of a QAPP Waiver Form.

While projects are underway, the NEP Quality Coordinator may conduct audits and/or site visits to determine if activities and procedures are consistent with the description in the QAPP (or waiver/contract). The NEP Quality Coordinator also documents problems that arise while planning or conducting a project in the form of a Corrective and Preventive Action Notice. The NEP Quality Coordinator also provides review of reports upon request. Finally, the NEP Quality Coordinator conducts QA-related training as needed.

Activities and Accomplishments

For the three-year period from July 1, 2015, through June 30, 2018, the NEP Quality Coordinator:

- Maintained positive working relationships and communications with key NEP contacts (e.g., former Lead Organization and current Strategic Initiative coordinators, grant and contract managers, technical staff).
- Met or consulted by phone with project managers preparing waivers and QAPPs.
- Became familiar with and/or reviewed scopes of work and/or plans for at least 125 projects.
- Recommended approval of waivers for approximately 114 projects.
- Recommended approval of 63 QAPPs.
- Reviewed and commented on 66 draft project reports, mostly for projects concluding under grants awarded by the original four Lead Organizations.
- Provided quality-related training via NEP QA website.

Difficulties Encountered and Solutions Proposed (2015–2018)

Table 2 lists some of the difficulties encountered while providing quality oversight for NEP-funded projects related to the protection and restoration of Puget Sound. These were among the problems listed in the 2015 QRM but were generally less prevalent during this reporting period.

Table 2. Difficulties (and associated solutions) in NEP-funded projects.

Difficulty	Solution
Determining need for preparing a QAPP (difficult for some types of projects).	■ Searched for QAPPs describing similar activities. ■ Sought advice and/or concurrence from the Ecology or EPA QA Officer.
Determining appropriate level of detail for a QAPP — the "graded approach" requires judgment.	Based decisions/comments on project impact, complexity, budget, and QAPPs for similar projects.
Projects proposing to use laboratories not accredited for certain methods.	Required accreditation or waived requirement due to nature of analysis (e.g., accredited by FDA).
Project beginning activities prior to QAPP approval.	■ Updated NEP QA website and conducted training. ■ Prepared Corrective and Preventive Action Notices as needed. ■ Stopped work (only a few projects).
Determining data entry requirements associated with NEP projects.	Discussed issue with EPA and Ecology staff.
Finding enough resources/time for various activities (e.g., uploading audit findings to a single central location; preparing CPANs documenting minor problems; updating relevant QA guidance; conducting certain needed QA training).	NEP Quality Coordinator can request Ecology manager to delegate review of NEP QAPPs to other Environmental Assessment Program staff.

CPANs: Corrective/Preventive Action Notices.

NEP System Modifications and New Initiatives

Recommendations include:

- Continue implementing a centralized QA oversight function for activities and projects conducted under EPA's Strategic Initiatives funding model.
  - Identify "primary provider" — Ecology's NEP Quality Coordinator or alternative.
  - Include Northwest Indian Fisheries Commission (NWIFC) projects.
- Conduct additional training sessions for NEP funding recipients.
  - General (e.g., quality systems and how to prepare a QAPP).
  - Specific (e.g., QAPP content for GIS or modeling projects).
- Continue to streamline the QAPP review and approval process.
- Help Ecology's QAO develop and implement:
  - A comprehensive QA training plan.
  - A new certification program for field staff.
- Increase the number of annual project audits (in-field and/or alternative types).

Quality System Reports by Ecology Programs 2015–2018

1. Air Quality Program

1.1. Current QA system and activities

The Washington State Ambient Air Monitoring Network (Washington Network) is designed to understand air pollution levels and characterize ambient air quality. The majority of Washington Network monitoring is for the criteria pollutants as identified in the federal Clean Air Act:

- Carbon Monoxide (CO)
- Lead
- Ozone (O_3)
- Nitrogen Dioxide (NO_2)
- Sulfur Dioxide (SO_2)
- $PM_{2.5}$ (airborne particles 2.5 microns and smaller)
- PM_{10} (airborne particles 10 microns and smaller)

Of these criteria pollutants, $PM_{2.5}$ and ozone represent the biggest risks to public health in Washington and therefore comprise the bulk of the Washington Network. In addition to the criteria pollutants, the Air Quality Program and its partners monitor the air for toxic pollutants, ozone precursor pollutants, PSD-quality meteorology,[11] and chemical components of $PM_{2.5}$.

The QA regulations in 40 CFR Part 58, Appendix A were developed so that ambient air monitoring programs ensure that:

- The level of data quality needed is clear.
- The checks are included to assess data quality.
- The corrective actions are in place to improve quality systems when needed.

The Air Quality Program's quality system for the Washington Network complies with the requirements of 40 CFR Part 58, Appendix A and with much of the guidance detailed in the EPA's *Quality Assurance Handbooks.* Data collected within the Washington Network is

[11] PSD = Prevention of Significant Deterioration

comparable to the data collected by other organizations around the country and is of sufficiently high quality for use in decision making.

There are approximately 2.75 FTE QA staff (including the program's QA Coordinator) in the Air Quality Program that carry out the following activities:

- Writing/revising the Washington Network Quality Assurance Plan.
- Writing/revising standard operating procedures.
- Writing Quality Assurance Project Plans (QAPPs).
- Reviewing and approving QAPPs from other entities within the network.
- Identifying appropriate Data and Measurement Quality Objectives for monitoring projects.
- Conducting performance assessments and systems audits on network monitors.
- Verifying quality control activities of field operators.
- Reviewing and validating monitored data to ensure quality is acceptable for intended uses.
- Certifying laboratory and field audit standards.
- Assessing data quality via quarterly and annual Data Quality Assessment Reports that are submitted to EPA and distributed to Washington Network managers and monitoring personnel.

1.2. QA training

All Ecology air monitoring and quality assurance staff are classified at either the Environmental Specialist 4 or Natural Resource Scientist 3 level. In order to qualify for these positions, staff must have commensurate education and qualifications (typically a Bachelor's degree or higher) to perform their work in air monitoring/quality assurance at a highly technical level.

Since the beginning of 2016, several new staff have been hired in air monitoring and quality assurance. New staff are required to complete an air monitoring/quality assurance training plan. These plans may be tailored slightly depending on the specialty area for the position. Below (Table 3) is the example of one such plan for an air monitoring operator. Table 4 describes some additional trainings that are not required. Typically, plans must be completed within the first calendar year of employment.

Table 3. Training activities to be performed/learned by air monitoring and quality assurance staff.

On-the-Job Training and/or Field Experience:	Date Completed
Read and become familiar with Ecology's Quality Assurance Plan and instrument standard operating procedures (SOPs).	
Read and become familiar with federal 40 CFR Parts 58, appendices A, D, and E as well as Quality Assurance Handbooks volumes 2 and 4.	
Job shadow NWRO NATTS and Trace-gas operator. Accompany them on as many trips into the field as it takes to feel comfortable completing all of the following tasks: ■ Perform air toxics quality control (QC) checks (recommended 4x). ■ Perform manual nephelometer QC checks (recommended 4x). ■ Perform four ozone manual QC checks (recommended 4x). ■ Collect, document, and ship National Air Toxics Trends Site (NATTS) air toxics samples (recommended 4x).	
Work with NWRO NATTS, Trace-gas operator, and other staff to learn your primary areas of responsibility: ■ Visit the NWRO and CRO monitoring sites you will operate: Beacon Hill, Enumclaw, Wenatchee, and Ellensburg. ■ Do the following activities at the above locations and become proficient in these areas: o Perform meteorological quality control (QC) checks. o Perform manual nephelometer QC checks. o Perform ozone manual QC checks. o Perform filter-based $PM_{2.5}$ or PM_{10} QC checks. o Perform CO and NO_2 manual quality control checks. o Perform routine maintenance, clean parts, replace batteries, and change filters. o Collect, document, and ship Federal Reference Method (FRM) PM2.5 samples. o Collect, document, and ship speciation samples.	
Job shadow NWRO's Speciation and Near-road operator. Accompany them on as many trips into the field as it takes to become proficient in all of the following tasks: ■ Visit the NWRO monitoring sites they operate. ■ Crosstrain with them by doing the following activities: o Perform meteorological quality control (QC) checks. o Perform nephelometer QC checks. o Perform $PM_{2.5}$ Chemical Speciation Network QC checks. o Perform ozone manual QC checks. o Perform filter-based $PM_{2.5}$ or PM_{10} QC checks.	

On-the-Job Training and/or Field Experience:	Date Completed
○ Perform CO and NO_2 manual quality control checks. ○ Perform BAM 1020 QC checks and perform routine maintenance. ○ Collect, document, and ship at least four Federal Reference Method (FRM) $PM_{2.5}$ samples. ○ Collect, document, and ship speciation samples.	
Job shadow the SWRO operator. Accompany them to the S. 36th St. site in Tacoma. Crosstrain with them by doing the following activities: ■ Perform BAM 1020 QC checks (recommended 2x). ■ Perform DART review.	
Late spring/early summer, job shadow ERO $PM_{2.5}$ and ozone operator. Accompany them on trips into the field to complete the following tasks: ■ Accompany them to the following sites in the Central region: ○ Wenatchee. ○ Ellensburg. ■ Crosstrain with them by doing the following activities: ○ Perform meteorological quality control (QC) checks. ○ Perform manual nephelometer QC checks.	
Coordinate with Calibration & Repair lab staff for a day-long visit to the Calibration & Repair lab. Train with them on: ■ M903 nephelometer operations, calibration, and maintenance. ■ Beta Attenuation Monitor 1020 $PM_{2.5}$ monitor operations and maintenance. ■ Ultrasonic meteorological sensor operation and recertification process. ■ Flow and temperature standard verification processes. ■ Ozone operations and maintenance. ■ Multi-gas calibrator operations and maintenance.	
Train with Quality Assurance staff. Meet with Quality Assurance Coordinator (QAC) to learn: ■ Quality system requirements overview. ■ Documentation. ■ Level 1 data review processes. ■ Coordinate with the QAC and QA staff to accompany them on audit trips. Include met, ozone, and BAM audits. ■ Two audit trips with QA staff conducting field audits. ■ Learn the gaseous auditing process. ■ Evaluate the two air-monitoring sites for accordance with 40 CFR 58, Appendix E siting and adherence to federal regulations and monitoring objectives.	

On-the-Job Training and/or Field Experience:	Date Completed
■ One audit trip with QA staff conducting field audits. ■ Evaluate the air-monitoring site for accordance with 40 CFR 58, Appendix E siting and adherence to federal regulations and monitoring objectives.	
Coordinate with the SWRO & Air Quality Operations Supervisor to meet with Telemetry Specialist and AQS Coordinator at HQ: ■ Learn what the Telemetry Specialist does for site communications and data polling, data logger configuration, modems and channel set up. ■ Learn what the AQS Coordinator does to submit data to EPA. Learn how to enter data in SIMS.	
■ Use Excel, R, or other statistical software to analyze and visually present air quality data collected from NWRO.	
■ Become proficient with the EnvistaARM software (your NWRO teammates can give you an introduction and the manual). ■ Learn how to run a variety of reports to analyze and conduct level 1 data review: o Station reports (1-hour and 1-minute). o Group reports (comparability of like-monitors). o Calibration reports. o Log book reports. o Diagnostics reports. ■ Learn how to make new log book entries.	
■ Become proficient with Envidas Ultimate data loggers and software tools to: o Review calibration results. o Make logbook entries. o Disable channels. o Run reports for raw data and diagnostic data. o Review configurations of data channels, calibration sequences, and diagnostic information.	

Table 4. Training Courses: (These are supplemental; they are not required and have no deadline.)

Course Title	Date Completed
SI:471 — General Quality Assurance Considerations for Ambient Air Monitoring	
APTI- SI:409 — Basic Air Pollution Meteorology	
Online Chemical Speciation Training — available through AMTIC	

2016

- Two air monitoring operators and one QA staff attended the 2016 National Ambient Air Monitoring Conference, which included several network-specific trainings.
- All air monitoring and QA staff completed the Outdoor Heat Stress Training.

2017

- All Ecology air monitoring operators and several external partner agency operators attended the Statewide Air Monitoring Operator Symposium in fall 2017. This event offered training on our largest networks (ozone, gaseous pollutants and multi-gas calibrators (CO, NO_2), Federal Equivalent Method $PM_{2.5}$, and nephelometers) as well as training in quality control and quality assurance activities.
- Two Calibration & Repair specialists attended the week-long, hands-on, Teledyne – Air Pollution Instrumentation Level II Advanced Training.
- All air monitoring and QA staff completed the Outdoor Heat Stress Training.

2018

- Sixteen Air Quality Program staff attended the National Ambient Air Monitoring Conference that was held in Portland, OR, from August 13–16, 2018. Due to the conference's proximity to Ecology's Olympia offices and low travel costs, the entire air monitoring team of approximately 16 people (air monitoring operators, QA staff, calibration & repair staff, and the Air Quality System Coordinator and management). Training elements included several national air monitoring programs (PAMS, NATTS, CSN, NCore) as well as EPA's technical systems audit training and session on quality assurance.
- One new Calibration & Repair specialist attended the week-long, hands-on, Teledyne – Air Pollution Instrumentation Level II Advanced Training.
- Two Calibration & Repair specialists attended the week-long Met One Instruments Training.
- All air monitoring and QA staff completed the Outdoor Heat Stress Training.

1.3. QAPPs

The Air Quality Program's Quality Assurance Plan[12] describes the objectives of Washington's air monitoring network (Washington Network), associated quality assurance and control, and the procedures used for ambient air quality monitoring. This document as well as the Air Toxics Monitoring QAPP[13] can be found on Ecology's website. Both of these documents are being revised, and updated versions are expected to be published by the end of 2019.

The Air Quality Program Quality Assurance Coordinator (QAC) has final approval authority of the Quality Assurance Plan and all project-specific air monitoring QAPPs that describe activities conducted within the Washington Network. The QAC typically approves one project-specific QAPP per year. During this reporting period, the QAC approved *Tri-Cities Ozone Precursor Study (2016)*.

1.4. SOP status

The Air Quality Program has established instrument-specific standard operating procedures for nearly all monitoring within the Washington Network. The EPA QAPP and SOPs are used for the $PM_{2.5}$ Chemical Speciation Network monitoring conducted within the Washington Network. Over the last four years, a concerted effort was made to revise and update Washington Network monitoring operations.

All SOPs approved in the period following the 2015 *Quality Report to Management*, are included in Appendix C.

A complete list of the Air Quality Program's SOPs[14] is available on Ecology's website.

1.5. Audits

The Air Quality Program QA staff conducts performance assessments (audits) on air monitors and meteorological sensors located at sites throughout the Washington Network. For criteria pollutants, at a minimum, Ecology follows the required frequency for conducting audits on Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors as described in 40 CFR 58, Appendix A.

The audit frequency is as follows:

- FRM/FEM particulate ($PM_{2.5}$ and PM_{10}) instruments: Twice per year.
- Gaseous pollutant monitors (CO, NO_2, O_3, SO_2): Once per year.

[12] https://fortress.wa.gov/ecy/publications/SummaryPages/99201.html

[13] https://fortress.wa.gov/ecy/publications/SummaryPages/0402018.html

[14] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Information-for-air-monitoring-professionals

- PSD-quality meteorological parameters (wind speed and direction, ambient temperature): Once per year.

1.6. QA anomalies and/or corrective actions

All QA/QC problems and corrective actions are identified in the quarterly and annual Data Quality Assessment Reports that are shared with EPA Region 10 and all Washington Network partner entities so that improvements can be made. Data not meeting Measurement Quality Objectives is not sent to EPA.

1.7. Future QA initiatives

- Hold another statewide monitoring operator training within the next three years.
- Finalize revisions to the Washington Network Quality Assurance Plan by the end of 2019.
- Finalize revisions to the Air Toxics Monitoring Quality Assurance Project Plan by fall 2019.
- All SOPs will be current within the last 3 years by the end of 2019. At the time of this writing, there is one SOP not meeting our 3-year revision/recertification schedule.

2. Environmental Assessment Program

2.1. Current QA system and activities

The Ecology QA Officer is located in the Environmental Assessment Program (EAP), so EAP plays a key role in implementing the agency's quality system. The agency Director is responsible for designating the QA Officer, and the QA Officer reports to both the EAP Program Manager and the agency Deputy Director.

With respect to the quality structure, a key responsibility of the QA Officer is to inform management of QA/QC issues and problems. Other key responsibilities related to the quality structure include:

- Act as the liaison between Ecology and other agencies on QA/QC matters.
- Provide technical support to all Ecology programs by working with Ecology's QA Coordinators.

There are four QA Coordinators in EAP:

- QA Coordinator for Manchester Environmental Laboratory (MEL) — 1 FTE.
- QA Coordinator to handle Laboratory Accreditation Unit (LAU) issues — 1 FTE.
- QA Coordinator to handle sampling and streamflow aspects of QA — 0.25 FTE.
- QA Coordinator for all aspects of NEP-related QA — 1 FTE.

The QA Officer acts as point of contact within EAP for data quality issues and is the final signature authority on EAP QAPPs, SOPs, and QA policies.

The EAP Program Manager is responsible for:

- Allocating the resources to implement the QA Policy and the *Quality Management Plan.*
- Implementing Ecology's QA Policy (Executive Policy 22-01) and *Quality Management Plan.*
- Delegating responsibilities for implementing a quality system at appropriate levels of the organization.

Staff Quality Responsibilities

EAP staff with quality responsibilities include project managers, project leads, field staff, MEL staff, and LAU staff. The specific responsibilities are given in Ecology's *Quality Management Plan*. For project managers and project leads, key responsibilities include preparing and implementing QAPPs as well as assessing and reporting the quality of data obtained. Field staff are responsible for ensuring that samples are properly collected according to the QAPP and the SOPs and that all field data are recorded.

MEL staff are responsible for analyzing environmental and QC samples according to the specifications in associated QAPPs and relevant SOPs.

LAU staff are responsible for administering Ecology's Environmental Laboratory Accreditation Program (ELAP). This program (1) assesses the capabilities of laboratories to accurately analyze environmental samples and (2) determines if the laboratories should be granted accreditation.

2.2. QA Training

EAP conducts annual training routinely at the start of field season. This training is mandatory for all field staff. The training includes and is not limited to:

- Heat stress training.
- Invasive species training.
- Training on relevant SOPs.
- Safety training.

Some units within EAP also conduct and record an annual audit of their field staff. An assigned senior staff member routinely trains all new staff and then does annual recertification of the samplers. All audit findings are documented by unit.

EAP also conducts a series of seminars that are primarily intended for staff to have an opportunity to practice their presentations skills and share their work with colleagues and other agency staff. These seminars also provide an excellent opportunity to receive feedback before taking presentations to a broader audience. During the reporting period, EAP presented 27 seminars.

2.3. QAPPs

From July 1, 2015, to June 30, 2018, EAP published approximately 62 Quality Assurance Project Plans (QAPPs), which included QAPP addenda.

A list of QAPPs generated by EAP[15] since 1994 is available on Ecology's website.

2.4. SOPs

As of June 2018, EAP has 101 SOPs (not including MEL and LAU). Approximately 91 of these are current, with the remaining number either in the process of recertification or in uncertain status. Appendix C lists all Ecology SOPs.

[15] https://fortress.wa.gov/ecy/publications/UIPages/PublicationList.aspx?IndexTypeName=Topic&NameValue=Quality%20Assurance%20Project%20Plans%20(QAPPs)&DocumentTypeName=Publication

Other EAP/Ecology Quality Documentation

A revision of Ecology's 2015 *Quality Management Plan* will be published in 2020. This is the agency plan to implement, document, and assess the effectiveness of the quality system supporting environmental data operations.

2.5. Audits

In 2016, EAP participated in the triennial Quality Systems Review conducted by EPA. They listed no observations or recommendations specific to EAP.

2.6. QA Anomalies and/or Corrective Actions

No QA anomalies or corrective actions were reported during the reporting period.

2.7. Future QA Initiatives

- An agencywide QA workshop is planned for fall of 2018. This workshop will be in response to one of the findings in the EPA audit of 2017.
- All SOPs will be current at the end of 2019.
- Implementation of a five-year QAPP revision plan.

3. Environmental Assessment Program — Laboratory Accreditation Unit

Rebecca Wood is the QA Coordinator for the Lab Accreditation Unit (LAU).

3.1. Current QA system and activities

Accredited Laboratories

The LAU currently accredits 459 environmental laboratories, located in 26 states and 2 Canadian provinces:

- 146 Commercial
- 184 Wastewater Treatment
- 15 Water Reclamation
- 50 Industrial
- 7 Tribal
- 12 Public Health
- 8 Academic
- 9 Federal
- 28 Governmental (Non-Federal, City, County, State, Public Utility/Environmental)

From July 1, 2015, to June 30, 2018, LAU staff conducted on-site audits of 96 accredited laboratories.

Accreditation of Manchester Environmental Laboratory (MEL)

The last audit of MEL conducted by LAU staff was in May 2017. The next audit is planned for 2020.

MEL maintains accreditation for general chemistry, trace metals, organics, and microbiology procedures in non-potable water and solids. The lab routinely receives satisfactory ratings on semi-annual proficiency testing (PT) sample results required for accreditation.

ELAP Certification of Ecology Drinking Water Program

EPA Region 10 Drinking Water Certification Officers (DWCOs) observed LAU DWCOs auditing Seattle Public Utilities, a city government laboratory, in February 2017. Reports of their observations were provided in April 2017. Each LAU DWCO was evaluated separately, and all received favorable evaluations with some helpful suggestions.

The LAU completed EPA's Annual Drinking Water Certification Questionnaires in 2016, 2017, and 2018.

3.2. QA Training

- July 2016 — Rebecca Wood took the EPA Drinking Water Certification Officer course and examination in Inorganic Chemistry at EPA in Cincinnati, Ohio.
- October 2017 — Rebecca Wood took a week long Radiochemistry Training Course with Nevada Technical Associates.
- June 2017 — Kamilee Ginder took the EPA Drinking Water Certification Officer Training refresher in Organic and Inorganic Chemistry at EPA Region 9.
- June 2017 — Aimee Bennett took the EPA Drinking Water Certification Officer Training refresher in Microbiology at EPA Region 9.
- April 2018 — Rosana McConkey attended Bioassay meeting and lecture at Washington State Department of Ecology.
- August 2018 — Rebecca Wood, Aimee Bennett, Kamilee Ginder, and Rosana McConkey attended an EPA seminar on Lab Fraud.
- Annual meetings with oversight agencies.

3.3. QAPPs

Not applicable.

3.4. SOP Status

A list of LAU SOPs is provided in Appendix C.

3.5. Audits

From February 14–17, 2017, the USEPA Region 10 Certification Officers performed an onsite assessment of Ecology's Laboratory Accreditation Unit for the certification of drinking water laboratories. The purpose of this review was to assess the state's compliance with the practices required under the Safe Drinking Water Act. The assessment included reviews of Washington's Principal State Laboratory Program, certification policies and procedures, records, responses to a questionnaire, and interviews with the auditors.

3.6. QA anomalies and/or corrective actions

Findings included an audit backlog, which the unit is working to address.

3.7. Planned QA activities

LAU plans to recertify an SOP dealing with Laboratory Accreditation Renewals during the next reporting period.

4. Environmental Assessment Program — Manchester Environmental Laboratory

4.1. Current QA system and activities

The goal of Ecology's Manchester Environmental Laboratory (MEL) is to support the agency by producing reliable, scientifically valid, and legally defensible data so informed decisions can be made regarding the health and safety of our environment and consumer products.

An effective QA program is essential for the credibility of any data-gathering effort from sample collection to data interpretation. Sample collection and data interpretation are functions organizationally separate from the laboratory and are therefore not covered by this report. Other quality management documents cover those functions.

It is MEL's policy that for activities conducted at MEL, QA shall be maintained at a level that will ensure that all environmental data generated and processed are scientifically valid and legally defensible, and are of acceptable precision and bias, representativeness, completeness, and comparability. To that end, the quality management steps and procedures are used throughout the entire analytical process, from receiving the sample to reporting the data.

A summary of all the instrumentation and method development activities (for July 1, 2015 – June 30, 2018) is attached in Appendix D.

Accuracy

Data will meet quantitative measurement quality objectives (MQOs) for precision and minimization of bias described in the SOP for each analytical procedure. MQOs are defined in Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Lombard and Kirchmer, 2004).

Representativeness

The degree to which analytical data represent the environment from which the sample is taken depends on factors involved in sampling, transportation, and analysis. The laboratory may be partially responsible for all of these factors for some studies, and for analysis only for others. MEL follows the following practices to assure data are representative:

- Supply clean sample containers of the appropriate type with preservatives when required by the associated QAPPs.
- When necessary, homogenize samples prior to taking aliquots for analysis.
- Use appropriate digestion and extraction procedures.
- Control laboratory contamination.
- Assure that reported data are correctly associated with the corresponding sample received by the laboratory.

Completeness

MEL strives to provide accurate, representative, and defensible data for one hundred percent of the tests requested by the data user.

Comparability

Comparability is a measure of the confidence with which one data set or method can be compared to another.

Legal Defensibility

To be able to defend data in a court of law, records are kept, in accordance with the agency's record retention policy, to demonstrate that samples were not tampered with after being received in the laboratory. Proper use of chain-of-custody procedures and proper security are followed while the samples are in the laboratory. The data are recorded, handled, and reported in such a way that prevents tampering. Observations are recorded in indelible ink. Good laboratory practices are followed by using the Laboratory Information Management System to record data and generate reports.

The guidelines outlined in the MEL's quality management plan are effectively met.

Performance-Based Measurement Systems (PBMS)

On October 6, 1997, EPA provided public notification (62 FR 52098) of a plan to implement PBMS for "*environmental monitoring in all of its media programs to the extent feasible*." Page 24 defined PBMS as "*a set of processes wherein the data quality needs, mandates, or limitations of a program or project are specified, and serve as criteria for selecting appropriate methods to meet those needs in a cost-effective manner."* The notice indicated that the regulated community would be able to select any appropriate analytical test method for use in complying with EPA's regulations. It further indicated that implementation of PBMS would improve data quality and encourage the advancement of analytical technologies.

Modifications to MEL methods are considered acceptable if they meet the criteria described below:

- Legal standing: Data generated in compliance with the PBMS framework must have the same legal standing as data generated using a promulgated EPA method.
- Scientifically sound and relevant validation process: Both the method validation and the PBMS documentation requirements should be based on principles that are widely accepted in the scientific community and on the intended use of the data.
- Clearly articulated and appropriate performance criteria: Performance criteria are the sensitivity, selectivity, and accuracy of the data.
- Documentation: Must be sufficient for independent verification (i.e., auditing) and reproduction by another laboratory.

- Careful implementation: Implementation of PBMS should consider how requirements of project officers will be affected.

Alternate determinative techniques or changes that degrade method performance are not allowed. If an analytical technique other than the techniques specified in the method is used, that technique must have a specificity equal to or better than the specificity of the techniques in the referenced method for the analytes of interest.

Each time a method is modified, the laboratory is required to repeat the procedures for Initial Demonstration of Capability (IDC). In addition, each analyst must demonstrate the ability to generate acceptable results by performing an IDC before analyzing samples for a parameter. Analysts must also perform annual demonstrations of capability by satisfactorily analyzing performance evaluation proficiency testing samples.

A Method Detection Limit (MDL) and/or a Lower Level of Quantitation (LLOQ) determination as required is performed for each new method and periodically as required by the method for the analyte of interest.

4.2. Quality-related training

All new MEL staff receive a standard orientation that includes review of all quality documents and pertinent SOPs. In addition, all analysts must perform an IDC and perform satisfactorily (within specified QC limits) on an unknown sample for each parameter they work with. Certain methods have the additional requirement that an MDL determination be performed by each new analyst. All 14 analysts perform annual MDL studies at the beginning of each year.

4.3. QAPPs

The MEL director has approval authority for all QAPPs that require laboratory services. Input is solicited from MEL's QA Coordinator and from the organic and inorganic chemistry supervisors.

4.4. Audits

- A comprehensive internal audit was performed by the MEL QAC from December 2016 – January 2017. There were several observations/findings in the audit.
- An audit of the air testing program was performed by Ecology's Air Quality Program QAC in April 2017. There was only one finding, and the program had significantly improved since the previous audit in 2015.

4.5. SOPs

A list of MEL SOPs during the reporting period are listed in Appendix C.

4.6. QA anomalies and/or corrective actions

Problem:	Samples analyzed over holding time.
Cause:	Samples arrive at laboratory with less than half of the holding time left and sometimes with only a few hours or less left.
Corrective action:	Remind clients of the importance of prompt delivery after sample collection.

Problem:	Samples arrive at laboratory over temperature limits.
Cause:	Sample coolers not adequately filled with ice before shipping to lab.
Corrective action:	Remind clients of the importance of using adequate ice to maintain temperature during transport.

Problem:	Method modification not in compliance with EAP Procedure 1-10;
Cause:	Lack of clarity of when to use this procedure and when not. Also this procedure only applies to MEL and is not used for outside labs.
Corrective action:	The QAO is working on revising the Procedure.

MEL's Accreditation Status

Since July 2015, MEL has maintained accreditation for all parameters requested as required by the *Quality Management Plan* and Ecology Executive Policy 22-02. MEL was audited by LAU in December 2017.

4.7. Planned QA activities — SOP updates

- HRMS data validation
- Microwave extraction for organics
- PBDEs by GCMS
- Brominated flame retardants by GCMSMS
- TPN by SM 4500-N B
- Organics data review
- Phthalates in consumer products
- Pesticides SPE
- Pesticides by GCMSMS
- Manual peak integration
- SOP for analytical SOPs
- Loss on ignition
- ICPMS by 6020
- Micro-florisil cleanup
- Data qualification of organic sample results

- Carbamates by LCMSMS LVI
- Organophosphorus flame retardants by LCMSMS
- GPC cleanup
- $PM_{2.5}$
- Percent solids
- Radiation protection
- TOC/DOC by SM 5310 B
- QuEcHERS extraction
- Data mailing and filing
- Balances

5. Hazardous Waste and Toxics Reduction Program

5.1. Current QA system and activities

Background and Summary

In support of the goals of the Resource Conservation and Recovery Act (RCRA) Compliance Program, compliance monitoring is performed on an annual or "as needed" basis on all facilities that generate dangerous waste. Gathering data for compliance monitoring is done through facility inspections. Under RCRA, the primary type of inspection conducted by the Ecology is the compliance evaluation inspection (CEI). During a CEI, samples may be collected for analysis to:

- Characterize a chemical waste.
- Verify the constituents of a hazardous waste.
- Gather data to support an enforcement action when significant RCRA violations are known, suspected, or revealed.

Sampling activities include sampling and analysis of various media. If legal proceedings ensue, the sample analysis results could be used as evidence.

It is Ecology and U.S. Environmental Protection Agency (EPA) policy to have an approved Quality Assurance Project Plan (QAPP) for all agency-sponsored and RCRA Performance Partnership Agreement sampling events. Ecology's Quality Management Plan, Policy 22-01, requires the development of a QAPP for all projects generating environmental data, and documentation of all field analytical and laboratory work using approved Standard Operating Procedures (SOP). The plan describes the objectives of the sampling and the procedures to follow to achieve those objectives. The program QAPP serves as the Hazardous Waste and Toxics Reduction programmatic QAPP. The current program QAPP will be updated in the 2017–2019 biennium.

The objectives of the Program QAPP are to:

- Provide a boilerplate QAPP using a specific sampling event example that can be adapted for most site-specific sampling.
- Have compliance inspectors use the QAPP during Hazardous Waste and Toxics Reduction Program (HWTR) sampling events and other project-based sampling events.
- Assist and provide project officers, field personnel, and compliance inspectors with Standard Operating Procedures (SOPs) for collecting samples. Assist inspectors and project officers in proper sample documentation, selection of suitable analytical test methodologies, and provide basic data validation procedures.

HWTR Compliance Inspectors completed ten QAPPs for planned sampling events, and three Sample of Opportunity QAPPs for unplanned sampling events during this reporting period (2015–2018). The amount of specific detail required in each QAPP varies by site and project.

Sampling or projects of limited scope may require minimal information in the QAPP, while projects with a significant workload or duration may require detailed information. An expanded QAPP may be required for complex sampling projects to ensure field investigation and laboratory analyses are properly planned and conducted to achieve the project objective. The program Quality Assurance Coordinator (QAC) assists inspectors in sampling and writing QAPPs for complex sampling events beyond the requirement of the program QAPP. Quality assurance project plans ensure compliance with specific data quality objectives (DQOs).

HWTR Compliance Sampling Events

HWTR conducts few sampling events. Sampling within the program typically falls into two categories:

1. Samples of opportunity.
2. Pre-planned sampling events.

Compliance sampling happens only when a compliance inspector has concerns about a generator's waste management activities. The inspector can take samples immediately without any pre-planning (samples of opportunity), or plan a sampling event for later (pre-planned sampling), or a combination of both. Historically, few QA/QC documents are generated for samples of opportunity. Facility inspection reports are regionally stored and archived.

In recent years, familiarizing compliance inspectors with the benefits of pre-planning has been quite successful. To that end, the next update of the HWTR QAPP will include a revised Samples of Opportunity QAPP template that can be modified for site-specific sampling events.

The program occasionally conducts sampling to obtain data for programmatic activities and/or possible regulation changes. This type of sampling is done very infrequently, and none was conducted in this reporting period.

As an indication of the amount of sampling done within our program, our last biennium sampling budget (July 1, 2015–June 30, 2018) was about $691, 000, which includes a $621,000 appropriation transfer to EAP budgeted for product testing. This number reflects a moderate increase in the program's sampling budget for the 2015–2018 biennium. Statewide and regional sampling training have enhanced the inspectors' sampling techniques, and emphasized the importance of pre-planning using a QAPP. As a result, we are experiencing an improvement in the quality of data used by the program. Upcoming sampling training will discuss when a sample of opportunity should be taken and when pre-planned sampling is required.

Training was not provided for the Corrective Action staff in the last biennium on data review and validation based on EPA Functional National Guidelines for Organic and Inorganic Data

review. There is no scheduled training on Data Review and Validation in the current biennium for HWTR Corrective Action staff.

Thirteen sampling events were conducted from July 2015 to June 2018 (Table 5). Samplings for product testing analysis are not included in this list of sampling events.

Table 5. Sampling events conducted by the Hazardous Waste and Toxics Reduction Program at the Department of Ecology.

Ecology Regional Offices	Sampling Events (July 2015–June 2018)	QAPP
NWRO	5	Yes
HQ	1	Yes
SWRO	5	Yes
ERO	2	Yes

Specific Quality Report to Management Quality Assurance Responses

FTEs designated to quality in the HWTR Program

The HWTR program has not allocated specific percentages of FTEs to quality assurance and quality control (QA/QC) activities other than work done by the program's QAC. More than twenty-five percent of this individual's FTE is dedicated to QA/QC and related activities including training, QAPP review and preparation, providing QA/QC advice and recommendations, and making the creation of QAPPs a routine and beneficial practice among compliance inspectors. In addition, the program included a commitment to QA/QC activities in the current HWTR Inspector's Manual (which outlines inspector requirements and training) and expects staff to provide, where appropriate, QAPPs for their sampling events.

Specific staff quality responsibilities in the HWTR Program

As indicated above, the only specific staff responsibilities in the HWTR Program are assigned to the program QAC. Because of the recent increase in the number of samplings done by the HWTR-HQ Section for product testing and the review of externally generated data, QA/QC responsibilities also increased and are now included in staff's job duties.

5.2. QA Training

The HWTR program conducts quality assurance and sampling trainings, to improve staff familiarity with sampling and improve the quality of the data obtained during sampling events. HWTR did not conduct statewide training during this reporting period. Individual inspectors took the EPA Trainex Training on RCRA Waste Sampling. The following training activities were completed by regulatory compliance staff and other Ecology staff in the current biennium.

Refresher Training

As part of ongoing professional development, compliance and other program staff attend outside agency training as required, such as:

- EPA Basic Inspector Training.
- EPA Region 10 Inspector Workshop.
- EPA Chemistry for Environmental Professionals.
- EPA Chemistry for Environmental Professionals, Fundamentals and Applied.
- University of Washington, Northwest Center for Occupational Health and Safety: Hazardous Material Evaluation.
- National Environmental Management Academy, Environmental Enforcement and Inspector Training.
- Professional Association Workshops such as Society for Environmental Toxicology and Chemistry, and American Chemical Society.

These trainings comply with EPA Competency Requirement and Certification.

Sampling assistance

The QAC works with staff to discuss possible compliance sampling. By working with them on a one-on-one basis, staff become more comfortable with the QA/QC process. There were written QAPPs prior to most of the sampling events conducted within this reporting period. Compliance inspectors have shown increased reliance in the use of the QAPP as a standard sampling requirement.

5.3. QAPPs and SOPs

The HWTR program has developed a programmatic QAPP Template that can be adapted for site-specific sampling, for use by compliance inspectors during HWTR sampling events; however, the next revision of the HWTR program QAPP will incorporate, by reference, Ecology EAP QAPP template and Product Testing Universal QAPPS for HWTR-HQ based studies and investigation projects. The following SOPs were developed for specific sampling events as part of the current program QAPP:

- Documentation of field activities and field report.
- Parts-washer sampling.
- Tank sampling.
- Antifreeze sampling.

The following draft SOPs will be included in the next HWTR QAPP revision:

- Soil and sediment sampling.
- Field pH sampling.

HWTR-HQ generated SOPs and joint program SOPs will be included in the next revision of the HWTR program QAPP.

Compliance Sampling Site-Specific Approved QAPP

Thirteen QAPPs/SOPs were approved for compliance sampling events from July 2015 to June 2018, including:

- Energy Pacific Truck
- Permafix NW SAP
- PSC Services
- Rogers Rubber
- Sea-soft Scuba
- Seattle Barrel
- Treoil
- Treoil SOP
- Puyallup Tribe Restoration
- American Trucking
- Mercury-Better Brakes
- Onalaska Wood

Approved QAPPs and SOPs

Six HWTR-HQ generated QAPPs and two SOPs were approved for activities from July 2015 through June 2018, including:

- Three QAPPs for Children's Safe Product Act (CSPA) analysis of products for specific chemicals of high concern to children.
- Three QAPPs for Consumer Product Testing.
- Two SOPs (Field audits, Product Testing Sample Handling/Deconstruction).

The program QAC's role is to review and evaluate QA/QC activities within the Hazardous Waste and Toxic Reduction program in accordance with Ecology Quality Management Plan. Per Ecology Quality Management Plan (3.2.1.3), Quality Assurance Coordinators review and approve QAPPs submitted by and for their program staff. However, based on an agreement between HWTR and the Environmental Assessment Program (EAP) management, Product Testing QAPPS/SOPs generated by the Hazardous Waste and Toxic Reduction program are approved by the Ecology Quality Assurance Officer. Prior to this agreement, QAPPs have been approved by the HWTR QAC and are sometimes jointly approved. The program QAC ensures HWTR's compliance with Ecology's quality assurance policy and quality management plan.

External Generated Non-Ecology SAPs and QAPPs

Project or facility QAPPs and Sampling and Analysis Plans (SAPs) submitted by external parties to HWTR for review are reviewed and approved by the respective site/project managers overseeing the site or facility. At the request of the site/project manager, such QAPPs/SAPs are reviewed by HWTR's QAC.

As part of the next QAPP revision, updates will include Standard Operating Procedures for Field Audits at HWTR Corrective Action Sites. The QAPP review and approval process will be streamlined to minimize impact to staff's workload.

The purpose of the SOP for field audits is to provide procedures to conduct field audits on activities (including field sampling and measurements) performed by external contractors following HWTR-approved SAPs or QAPPs.

The field audit serves as an upfront QA/QC practice to ensure that any field activities leading to adverse data collection are prevented or identified and corrected promptly. Field audits are currently conducted through the completion of a field audit checklist form in the field by the contractor, and attested by the Ecology HTWR audit staff.

Other program-specific quality documentation for the HWTR Program

The program compliance unit conducted fewer sampling events in this reporting period (July 2015–June 2018), and no additional quality needs have been identified. However, there is a need for quality documentation of externally received data and data generated from product testing to ensure that specific data quality objectives are met. It is equally important that the specific data quality documentation is scientifically defensible.

5.4. Other QA Activities in the HWTR Program

Apart from EPA-Manchester laboratory, the HWTR program has contract agreements with eight certified private laboratories to conduct analyses on samples received from Ecology compliance and HWTR-HQ staff.

Program staff also assist local and county government in conducting sampling events and reviewing quality assurance project plans.

Additional subject-specific QAPPs were developed by HWTR for the Children's Safe Product Act (CSPA) analysis of products for specific chemicals of high concern to children.

HWTR Program Headquarters (HQ) Project QAPPs

HWTR Program HQ project QAPPs are subject to review and approval by the program QA Coordinator. All project work conducted by HWTR-HQ met the program and agency QA/QC requirements, and no sampling occurred without an approved SOP and QAPP. Below is the list of HWTR-HQ-approved project QAPPs.

HWTR-PUBLISHED SUBJECT-SPECIFIC PROJECT REPORTS AND QAPPS (2015–2018)

- Addendum #2 to Quality Assurance Project Plan — Flame Retardants in General Consumer and Children's Products 2016[16]
- Quality Assurance Project Plan: Flame Retardants in General Consumer and Children's Products[17]
- Flame Retardants — A Report to the Legislature 2015[18]

5.5. Audits

Two audits of RCRA Corrective Action Sites were conducted in 2016 and 2017.

5.6. QA anomalies and/or corrective actions

Sample collection anomalies were noted and corrected.

5.7. Planned QA activities

The HWTR Program QAPP will be updated in 2019. The update to the HWTR program QAPP will also include Standard Operating Procedures for Field Audits at HWTR RCRA Corrective Action Sites and procedures for RCRA corrective action project data review and validation for externally received data or validated laboratory analytical data. The product testing programmatic QAPP will be updated in 2020.

HWTR INSPECTOR'S TRAINING WORKSHOP (OCTOBER 24–25, 2018)

This was a joint training held in October 2018 with EPA Region 4, Ecology HWTR staff, and AYXS SGS Laboratory in Sidney, British Columbia. HWTR staff from across the state along with other Ecology staff attended the training. EPA trainers demonstrated the use of sampling equipment and provided hands-on practice for the most commonly used sampling equipment. AYXS SGS Laboratory presented a training on interpreting and evaluating data quality of laboratory results. Case studies, the HWTR QAPP, and a recent update in the EPA SW-846 Test Methods were discussed.

[16] https://fortress.wa.gov/ecy/publications/documents/1207025b.pdf

[17] https://fortress.wa.gov/ecy/publications/documents/1207025.pdf

[18] https://fortress.wa.gov/ecy/publications/documents/1404047.pdf

6. Nuclear Waste Program

6.1. Current QA system and activities

Overview of the Nuclear Waste Program quality system

The Nuclear Waste Program (NWP) quality system is a team of scientists comprised of five chemists. These chemists possess many years of relevant laboratory experience including wastewater laboratory accreditation, QA management of a Hanford site lab, instrumental analyses at Hanford site labs dealing with radiochemical-contaminated matrices, and certifications in EPA data validation.

Approximately fifty percent of the chemists' FTE is dedicated to:

- Data package review.
- Modeling QA and statistical QA.
- Tank farm SAPS.
- RCRA corrective action.
- CERCLA cleanup.
- Vitrification plant QA/QC.
- Contracted lab audit and work scope.

Program wide, a total of 2.5 FTE are dedicated to QA. Prior experience includes preparing sampling and analysis plans for the purpose of Hanford waste site characterization, and practical experience completing statistical analysis of environmental data. The NWP chemists work closely with the Washington State Department of Health (DOH) Office of Radiation Protection, EPA Region 10, and other programs within Ecology on QA issues at the Hanford site. The NWP biennial plan contains the chemistry implementation plan where QA is described.

Quality Assurance Coordinator — Roles and Responsibilities

- Coordinates the EPA QA audit of Ecology:
  - Most recently, in 2016.
  - Documentary audit of the NWP in 2009, which was conducted by EPA Region 10 staff at the Hanford Site.
- Serves as point of contact for dissemination of information from Ecology's QA Officer to NWP chemistry team regarding new QA initiatives, applicable training opportunities, etc.
- Represents NWP at agencywide QA Coordinators meetings.
- Performs other duties as spelled out in the agency Quality Management Plan and the NWP Hanford Site-wide Chemistry Implementation Plan.

The QA activities for NWP (in the current reporting cycle) include:

- Hanford site-wide permit for the Waste Analysis Plan/Sampling and Analysis Plan (WAP/SAP) QA/QC (2016–present).
- QA Sections 6.5 and 7.8 of the Hanford Federal Facility Agreement (1992–present).
- Hanford Analytical Services Quality Requirements Document updates (1996–present).
- Implementation of a Technetium soil blind program for vadose soil sampling (2018–present).
- U.S. Department of Energy contracted commercial lab PQL's standardization report (2017–present).
- Data generation review, verification, and validation for fate and transport modeling, U.S. Department of Energy Performance Assessments and Environmental Risk Assessments (2010–present).
- Quality Assurance program assessments of Hanford Mixed Waste Laboratories (1996–present).
- Taking split samples at CERCLA and RCRA closure remediation sites for final closeout confirmation (1992–present).
- Maintaining contracts and assessing the performance of ALS Environmental and mixed waste analytical laboratories (1992–present).
- Continued involvement with HWTR Inspector Hands-on Sampling Training for EPA certification (2015–present).
- Hanford site-wide permit for the WAP/conceptual agreement plan development (2016–present).

6.2. QA-Related Training

Program training included:

- EPA Quality Management Conference (August 2018).
- EPA Sampling for Regulatory Purposes Training (January 2017).
- Visual Sample Plan Training (March 2017).
- TNI Training Webinar: Method Selection, Validation, and Demonstration of Capability (August 2017).

6.3. QAPPs Developed or Approved

NWP chemists approve all QAPPS for this program. In addition, NWP chemists also approve and review Hanford site contractor-generated QAPPs. All the QAPPs approved in this reporting period are listed below:

Single Shell Tank SAPs:

- SST SAP (revised May 2016).
- C-301, May 2019.
- A-104, May 2019 (non-residual sample).
- A-105, August 2018 (non-residual sample).
- C-105, August 2018.
- C-102, December 2016.
- C-111, June 2016.
- C-112, March 2016.
- 200-BP-5 Removal Action Work Plan Data Quality Objectives (September 2018).
- Sampling and Analysis Plan and the Closure Plan (Addendum H) of the Hexone Storage & Treatment Facility, Permit Revision 9 (April 2019).
- 200-EA-1 Work Plan and Sampling and Analysis Plan (June 2019).
- Groundwater Monitoring Plan for the 216-S-10 Pond and Ditch (October 2018).
- Central Plateau Groundwater Tracer Study Sampling and Analysis Plan (January 2019).
- 200-BP-5 and 200-PO-1 Groundwater Operable Units Feasibility Study for Interim Action (May 2019).
- Groundwater Sampling and Analysis Plan for the 200-BP-5 Groundwater Operable Unit (March 2017).
- 100-HR-3 Sampling and Analysis Plan, Remedial Design/Remedial Action Work Plan and the Operations and Maintenance Plan (March 2016).
- Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites (August 2016).
- Waste Treatment and Immobilization Plant Quality Assurance Project Plan for Waste Analysis Plant WA7890008967 (September 5, 2017).
- Test Bed Initiative (TBI) Phase 2 Research, Development and Demonstration Permit Application DOE/ORP-2019-02 Rev 0 DQO, QAPP (June 2019).

In addition to QAPP approval, a breakdown of documents reviewed by NWP chemists is shown in Table 6 below.

Table 6. Documents reviewed by Nuclear Waste Program chemists.

Chemist staff	SAP	QAPP	DQO	WAP	Closure Plan
Barnes	16				
Davis	2			3	2
Smith-Jackson	10	1		2	7
Soto	5		3	6	40
Yokel	5	5	2	5	1
Total	**38**	**6**	**5**	**16**	**50**

6.4. SOPs

NWP currently has two active SOPs, which are listed in Appendix C.

6.5. Audits

In 2016, NWP participated in the triennial Quality Systems Review conducted by EPA. They listed no observations or recommendations specific to NWP.

6.6. QA anomalies and/or corrective actions

- Sample and analyze tank waste prior to transfer to waste treatment plant.
- Assess Hanford site laboratories.
- Assess field screening versus laboratory QA/QC.
- Incorporate Hanford Analytical Services Quality Assurance Requirements Document (HASQARD) auditing into the DOECAP (Department of Energy Consolidated Audit Program).
- Assure QA of fate and transport modeling used for the Integrated Disposal Facility and the Tank Farm Performance Assessments are of equal or better quality than the Tank Closure Waste Management Environmental Impact Assessment.
- Develop Hanford Site-Wide Permit WAP CAP including Ecology's Executive Policy 22-02.
- Establish and standardize practical quantification limits (PQL's) for groundwater monitoring SAPs.

6.7. Planned QA activities

- Visit to Manchester Environmental Laboratory.
- Visit to Washington State Department of Ecology Laboratory Accreditation Program.

7. Shorelands and Environmental Assistance Program

7.1. Current QA system and activities

The Shorelands and Environmental Assistance (SEA) Program uses a diverse range of activities to implement its mission to work in partnership with communities to support healthy watersheds and promote statewide environmental interests. The program follows the criteria for "best available science" as defined in WAC 365-195-905 when developing technical and regulatory guidance and tools.

Amy Yahnke was designated as the QA Coordinator for SEA Program in April 2015. SEA Program dedicates 0.05 FTE to QA.

The Legislature created the Office of Chehalis Basin (OCB) in 2017, which became functional when the capital budget was passed in January 2018. The statutory charge for OCB is to aggressively pursue implementation of an integrated strategy and administer funding for long-term flood damage reduction and aquatic species restoration in the Chehalis River Basin. As with the Office of Columbia River (OCR), the OCB is an independent office within Ecology, but OCB falls under the umbrella of the SEA program for administrative purposes. Prior to 2018, development of the Chehalis Basin Strategy was funded through the Office of Financial Management (OFM). During the reporting period, OCB had not assigned any FTE to quality systems. Additionally, the QA onboarding process for OCB was not finished by the end of the reporting period of this Quality Report to Management.

7.2. QA training

SEA has no training activities for quality assessment at a program level.

OCB had no QA training activities in the reporting period.

7.3. QAPPs and SOPs

SEA currently has no programmatic QAPPs. Project-based QAPPs are developed as needed. Generally, SEA Program generates up to two QAPPs per year for grant-based projects. Projects with Ecology-approved QAPPs are indicated in the list of SOPs below.

Updated list of SOPs, Guidance Documents, QAPPs, and Associated Training

The following are completed:

- Improved Wetland Identification for Conservation and Regulatory Priorities: Work for this project is being done under EPA Grant # CD01J09401. The goal is to improve wetland identification using a semi-automated remote sensing approach, followed by standard photo interpretation to meet Federal Geographic Data Committee standards for inclusion in the National Wetland Inventory. The project includes collection of data for verification of wetland and upland locations that contribute to the semi-automated process. Ecology-approved QAPPs exist for the semi-automated remote sensing and the

photo interpretation aspects of the project. An Ecology-approved SOP (SEA001: Field Verification of Remotely Sensed Wetland Maps, V 1.0) exists for the verification of data collection.

- **Characterizing Wetland Buffers:** Work for this project was done with funding from an EPA Wetland Program Development Grant (Wetland Program Development Grant: CD-00J47401-0) under an Ecology-approved QAPP. The final report was submitted to EPA in December 2013. The public report[19] was completed and published September 2017.
- **"Ordinary High Water Mark" (OHWM) Determinations:** Ecology developed a combined streams, marine, and lakes manual that includes OHWM determination SOPs (Ecology Publication 16-06-029).[20] This manual was completed and published in October 2016. The document provides guidance to professionals making regulatory OHWM determinations (and those reviewing determinations) to define the extent of the shoreline management area under the Shoreline Management Act. Ecology provides OHWM training through the Coastal Training Program.
- **National Wetland Condition Assessment (NWCA):** This is part of the National Aquatic Resource Surveys conducted by EPA on a rotational basis every five years. Wetlands staff collected data for NWCA in 2011 and 2016 with funding from EPA. EPA generates and maintains SOPs and QAPPs for the project. The next NWCA is scheduled for 2021.
- NWCA 2016 QAPP.[21]
- NWCA 2016 Field Operations Manual.[22]
- **Watershed Characterization:** A QAPP was not required when this project started, but a QAPP has now been prepared and was approved by Ecology for updates to the original broad-scale models and the development and testing of new mid-scale models. Documentation for this project includes reports for the assessment of water flow and water quality (*Puget Sound Characterization, Volume 1*), habitat (*The Puget Sound Watershed Characterization Project, Volume 2*), and a user's guide (*Volume 3: User's Guide for the Puget Sound Watershed Characterization*). The latest version of Volume 1 (October 2016) includes Appendix D which describes geospatial methods. Volume 2 was prepared by Washington Department of Fish and Wildlife and includes details for the habitat assessment methods. Volume 3 provides guidance for the use of the watershed characterization tool. The documents and data[23] are maintained on Ecology's website.

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[19] https://fortress.wa.gov/ecy/publications/SummaryPages/1706008.html

[20] https://fortress.wa.gov/ecy/publications/summarypages/1606029.html

[21] https://www.epa.gov/sites/production/files/2017-08/documents/nwca_2016_qapp_v1_0_apr2016_signed.pdf

[22] https://www.epa.gov/sites/production/files/2017-08/documents/nwca2016_fom_v1_1a_full_0.pdf

[23] https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Watershed-characterization-project

- Wetland Delineations:[24] This is a federally developed SOP maintained by the U.S. Army Corp of Engineers. Ecology does not disseminate it.
- Wetlands Rating Systems: Ecology developed two systems that assess wetland functions to inform regulation of wetland impacts: one for Eastern and one for Western Washington. Ecology provides training to users of the rating systems through the Coastal Training Program and by arrangement. The rating systems have been revised or updated approximately every 10 years to incorporate the most current, best available science. The most recent update was completed in 2014. We are currently working on a project to develop an online mapping tool to assist with generating the figures required in the rating system and to create an electronic version of the rating form. The project is funded through an EPA grant, and no QAPP is required. The rating systems[25] and lists of people trained in the rating systems for Eastern and Western Washington are maintained on Ecology's website.
- Wetlands Credit/Debit Systems: Ecology developed two systems to guide activities related to compensatory mitigation for wetland impacts: one for Eastern and one for Western Washington. Development of the credit/debit systems was based on the wetlands rating systems, and an outgrowth of a need for in-lieu fee programs to account for wetland functions. Ecology provides training to users of the credit/debit systems through the Coastal Training Program and by arrangement. The credit/debit systems[26] and lists of people trained in the credit/debit systems for Eastern and Western Washington are maintained on Ecology's website.
- Padilla Bay Weather and Water Quality Data: The National Estuarine Research Reserve System (NERRS) and National Oceanic and Atmospheric Administration (NOAA) developed SOPs and quality assurance procedures for this project. All reserves are funded and required to follow these protocols, which are periodically updated to improve data quality. In addition, Padilla Bay staff attend training in South Carolina with other NERRS staff every second year or every year depending on the number of updates and changes to protocols. As part of the water quality monitoring, they also collect total suspended solids following national System Wide Monitoring Program protocols, and samples are collected for dissolved nutrients that are analyzed by the ocean chemistry department at the University of Washington following their EPA-based protocols.
- Padilla Bay Chlorophyll: EAP developed and approved SOPs as part of the laboratory certification process. Chlorophyll is measured as part of the NERRS system-wide monitoring program and needs to follow the NERRS protocols.

[24] https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Delineation-resources

[25] https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Rating-systems

[26] https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Credit-debit-method

- **Padilla Bay Long-term Eelgrass Monitoring:** Eelgrass performance and growth metrics are monitored following a protocol established for NERRS.
- **Padilla Bay Blue Carbon:** As part of recent externally funded blue carbon work, Padilla Bay staff collect carbon content data on estuarine and marsh sediments. This is following protocols established by the Blue Carbon Initiative, as well as work by the Pacific Northwest Blue Carbon Project Team to refine these methods and improve the accuracy and reliability of these relatively new methods.[27]
- **Modeled Wetland Inventory:** Work for this project is done under an Ecology-approved QAPP with initial funding from EPA Grant #PC-00J283-01. Data for the project[28] are maintained on Ecology's website. Documentation of the project[29] is maintained on Ecology's website. Data can be viewed online.[30]
- **Monitoring Wetlands Mitigation Compliance:** This program started in 2007 with funding from EPA (#WL-96015101). An Ecology-approved QAPP was established, and SOPs are included in *Appendix C — Procedures for Visiting Wetland Compensatory Mitigation Sites*. The compliance team meets as needed to discuss technical and policy issues, and follow-up and compliance protocols. Datasheets and procedural checklists are used to ensure consistent collection and recording of compliance information. Over time, these datasheets and checklists have evolved as the program has become more established. Because of that, staff have indicated a need to update the original SOPs. Compliance information, including numeric and qualitative ratings of regulatory compliance and ecological success, may be used to analyze the success of wetland mitigation in the future. Staff will update the SOP documentation as time allows over the next two years.
- **Channel Migration Zones:** Work was done under an Ecology-approved QAPP for this project with NEP grant funding from the EPA. Project ended in 2014. This work continues to inform guidance documents.
- **Dredge and Fill Materials:** SEA Program works with the U.S. Army Corps of Engineers to implement testing requirements of dredge and fill materials associated with CWA Section 404 permits. Quality assurance is maintained by the Corps for those activities.

OCB currently has no programmatic QAPPs. Project-based QAPPs are not likely to be needed, as OCB staff do not design or implement projects that require QAPPs. It is anticipated that OCB will generate 10–12 QAPPs per biennium for projects funded through pass-through funds.

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[27] http://www.cifor.org/library/5095/coastal-blue-carbon-methods-for-assessing-carbon-stocks-and-emissions-factors-in-mangroves-tidal-salt-marshes-and-seagrasses/

[28] https://ecology.wa.gov/Research-Data/Data-resources/Geographic-Information-Systems-GIS/Data#m

[29] https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources

[30] https://waecy.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=22edd2e4e7874badbef2a907a3cd4de6

7.4. Audits

The 2016 triennial Quality Systems Review was completed by EPA. They listed no observations or recommendations specific to SEA Program.

7.5. QA anomalies and/or corrective actions

No QA anomalies and/or corrective actions noted.

7.6. Planned QA activities

Respiration/Oxygen Consumption QAPP: Padilla Bay scientists worked with Ecology's modelling group on a QAPP to quantify respiration/oxygen consumption in the pelagic environment. These data will be used to generate rates to be included in the Salish Sea Water Quality model. The QAPP is approved and awaiting publication.

The following QA documents are currently being developed:

- **Beach Morphology Monitoring:** SOP-oriented peer-reviewed literature exists that documents methods. SOPs are written for some individual tasks (e.g., planning, equipment setup, and collection, processing); both a general SOP and more detailed SOPs for other specific tasks will be completed as staff time allows.
- **Boat-Based Beach and Bluff Mapping:** Ecology-approved QAPP exists for EPA-funded project on mobile lidar for boat-based mapping. SOPs are under development, as the methods for collection and processing are finalized. SOPs will be completed as staff time allows. The final project report[31] was published in September 2018.
- **Multi-Beam Sonar Surveying:** Draft SOPs for near-shore morphology surveys are under development as methods for collection and processing are finalized. SOPs will be completed as staff time allows.
- **Beach Surface Sediment Sampling:** The near-complete SOP describes how to dry, sieve, and weigh sediment samples collected during beach monitoring surveys. The SOP is currently being revised.

[31] https://fortress.wa.gov/ecy/publications/documents/1806008.pdf

8. Solid Waste Management Program (formerly Waste 2 Resources Program)

8.1. Current QA system and activities

The Solid Waste Management (SWM) Program interacts with the quality system in several areas including:

- Industrial Section permitting, compliance monitoring, and enforcement activities.
- Statewide Resources Section waste characterization activities.
- Regional Offices biosolids permitting and solid waste technical assistance/corrective action activities.

Industrial Section Quality Systems

The Industrial Section is focused on three major industries of Washington State: aluminum smelters, oil refineries, and pulp and paper mills. The section also works with several smaller facilities that support the primary industries as well as several large industries outside the primary industry groups. The section's staff is trained to handle the complexities of these industries and is responsible for environmental permitting, site inspections, and compliance issues. The section regulates air, water, hazardous waste, and cleanup management activities for these industries.

Statewide Resources Section Quality Systems

The Statewide Resources Section (SRS) is responsible for policy, rulemaking, and data collection and analysis activities regarding the management of solid waste, biosolids, organics, mercury lights, electronics, and other recyclable materials.

Although the SRS has performed ad-hoc sampling related to specific odor-related incidents at composting facilities and solid waste sludge at a land application facility, SRS staff do not perform routine sampling. Local jurisdictional health authorities have primary regulatory responsibility for permitted solid waste facilities, and their interactions with program staff are most commonly through the regional offices. Ecology does have jurisdiction over conditionally exempt solid waste facilities, but regular inspections and sampling events are not conducted at these facilities due to limited resources and the sheer number of exempt solid waste facilities.

RCW 70.95 requires Ecology to conduct periodic characterizations of the state's municipal solid waste (MSW). The state plan for solid and hazardous wastes recommends that waste characterization studies be done every 4–5 years due to growing population.

SRS has a major data task in the collection of annual reports from about 375 biosolids facilities. About half of these facilities generate data related to biosolids quality. Historically, data were submitted in hard copy reports. The program has encouraged email submittals in recent years, and we hope to progress to online submittal in 2018.

Regional Office Quality Systems

The SWM Program's Regional Office sections are responsible for permitting, compliance monitoring, and enforcement of biosolids facilities with coverage under WAC 173-308. Ecology has direct responsibility for related activities in most counties of the state; limited local agreements are in place in some cases. Data are primarily collected by permittees or their representatives, and are assessed by Ecology. Timing of assessment and the nature of the data depends on the situation. About half the facilities in the state submit data with their annual reports, due by March 1 each year. Data is submitted at other times of the year as well, when it is associated with projects such as lagoon cleanouts (biosolids characterization), or agronomic rate determinations (soil nitrogen). Typically, regional staff are the first contact for evaluation of project-specific data. That information often accompanies annual reports. Regions have access to annual report data and will evaluate information on specific facilities, as necessary. Regions rely on headquarters for annual data entry and overall assessment.

Regional Office sections are also responsible for a range of activities in the area of solid waste handling. Jurisdictional health departments (JHDs) have the primary authority for the permitting of solid waste handling facilities. Regional Office sections are charged with providing technical assistance to JHDs, facility owner/operators, and the public on solid waste permitting, facility design and operations, and compliance monitoring. Regional Office sections may also have the primary site management role for corrective actions being conducted under the Model Toxics Control Act at permitted solid waste facilities.

In either the technical assistance or site management role, Regional Office staff typically do not conduct sampling directly. Compliance monitoring sampling for solid waste facilities is usually conducted by the facility owner/operator or, in some atypical circumstances, by the permitting JHD.

8.2. QA Training

SWM staff did not receive specific QA training during the reporting period. Some implied QA instruction is acquired "on the job" as Industrial section Facility Engineers conduct inspections with sampling. QA procedures are followed for collecting, preserving, transporting, and chain of custody requirements.

8.3. QAPPs

Industrial Section QAPPs

As part of its compliance assurance activities, the Industrial Section conducts National Pollutant Discharge Elimination System (NPDES) water inspections with sampling. Compliance inspections include sampling of wastewater effluent, wastewater influent, sanitary wastewater influent, sanitary wastewater effluent, and stormwater discharges. Analytes are site specific and are dependent on the type of industrial facility (e.g., pulp and paper, refinery, or chemical manufacturing). QAPPs are developed for each compliance

sampling inspection to ensure data validity and enforceability. Approximately 80 QAPPs were used during the reporting period.

The Industrial Section is also responsible for the review and tracking of extensive self-monitoring data from permittees. The section receives monthly reports under both the Air Operating Permit program and the NPDES/State Waste Discharge program. The section is responsible for review, data entry, compliance evaluation, and reporting to EPA under Ecology's Performance Partnership Agreement. The section also receives reviews and tracks ad hoc studies that are required under these permits (e.g., receiving water studies and outfall modeling reports).

Approximately five percent FTE is dedicated to QA for the SWM program.

The estimated annual number of QAPPs generated by the SWM Program is one. Two QAPPs are in the process of being revised or renewed. Currently, no QAPPs are approved within the SWM program. Future SWM QAPPs will be approved by the SWM QAC.

Regional Office QAPPs

Regional Office staff will usually provide review and comment on Sampling and Analysis Plans (SAPs) and/or Quality Assurance Project Plans that have been prepared by owner/operators for compliance monitoring programs at solid waste facilities.

Similarly, Regional Office staff performing corrective action site management will review, comment on, and approve SAPs and QAPPs for sampling programs conducted by potentially liable parties. These sampling programs are designed to provide data for site characterization, remedy selection, and cleanup compliance monitoring.

Regional Office staff may also be involved in review, comment, and approval processes for Construction Quality Assurance plans (CQAP) and reports for biosolids facilities, or in the solid waste technical assistance and corrective action site management roles. Regional Office staff may perform field observations of sampling activities conducted by facilities to verify that the sampling is conducted in conformance with the applicable standard operating procedures, SAP, CQAP, or QAPP for the activity. Regional Office staff are also tasked to ensure that data generated for corrective actions and for compliance monitoring at biosolids and solid waste facilities is submitted to Ecology's Environmental Information Management (EIM) system in accordance with data submittal procedures established by EAP.

8.4. SOP Status

Over the past year, the Industrial Section has continued developing standard operating procedures (SOPs) to clarify expectations for staff, and ensure that our data review and tracking obligations to EPA and Ecology's programs are met in a timely and complete way. Through clear definition of roles, responsibilities, and expectations, these SOPs will (1) increase the quality of data that goes into our databases, and (2) improve our

implementation of the State's delegated programs. The list of SWM SOPs can be found in Appendix C.

The section will continue to create and update its SOPs on a triennial basis.

8.5. Audits

No audits conducted during the reporting period.

8.6. QA anomalies and/or corrective actions

No anomalies/corrective actions occurred.

8.7. Planned QA activities

QAPP and SOP recertifications are planned as their timeframes dictate.

9. Spill Prevention, Preparedness and Response Program

9.1. Current QA system and activities

Program Coordinator

The Spill Prevention, Preparedness, and Response Program (Spills Program) has one QA Coordinator who dedicates ten percent of their time to QA/QC activities. The primary objective of this position is to improve sampling data quality within the Spills Program. The person in this position is a designated Sampling Specialist, and is responsible for developing all Spills Program-specific sampling policies, procedures, guidelines, forms, and other related tools. The QA Coordinator also develops and conducts sampling training for program staff, ensures that sampling-related tools are made available to staff, and acts as the lead Sampling Specialist during spill responses.

QA Implementation

Spills are emergencies, and advanced planning is necessarily limited. In light of this, the Spills Program does not generate Quality Assurance Project Plans (QAPPs). However, the Spills Program has developed policies and procedures, in cooperation with NOAA, the U.S. Coast Guard, and EPA, that ensure that high quality samples and data are collected in a manner that is legally defensible.

Program staff use a *Sampling Plan Template* to develop a plan for any sampling associated with an incident. The template prompts the user to define the sampling objective(s), to sketch out the area impacted by the spill, and to identify sampling sites, the number, and type of samples to be collected, and the appropriate containers. The template also refers the user to *Sampling Guidelines* that have been developed specifically for collection of samples associated with oil spills; however, the guidelines can be applied to spills of other materials. Included on the reverse side of the template is a *Sampling Documentation Form*, used to record and summarize sampling-related information.

Once samples have been collected, Spills Program staff are encouraged to use an *Oil Spill Chain-of-Custody/Request for Analysis Form* developed specifically for oil-spill-related samples. Guidelines on the back of the form help the user select the appropriate analyses and also provide associated information such as sample size and container.

For larger spills, a Sampling Specialist develops a *Comprehensive Sampling Plan* that coordinates all sampling activities associated with the incident. Again, a template is used, but the information included in the template is much more detailed and includes QA guidelines.

State, federal, and oil corporation natural resource damage assessment (NRDA) representatives meet regularly as an informal group called the *Joint Assessment Team* (JAT). This group developed a comprehensive guidance document for cooperative NRDAs that includes guidelines for developing a sampling plan with similar components to the

Ephemeral Data Collection Plans. If there is an oil spill, the document identifies nationally recognized and accepted procedures that would be used by Spills Program staff and others to develop and implement an NRDA.

All forms, guidelines, and procedures are available to Spills Program staff on the internal Spills SharePoint site.

9.2. QA Training

Spills Program staff provide basic and intermediate sampling training described in the previous section. All program staff that may collect samples are required to take basic sampling training that includes information necessary to collect qualitative samples associated with oil spills. All full-time and after-hours spill responders receive annual basic sampling training that includes three hours of classroom and hands-on field exercises.

Oil spill response utilizes a standardized approach to command, control, and coordination known as the Incident Command System (ICS). ICS allows responders from multiple agencies to work together effectively by providing a common hierarchy, language, and structure. Sampling Specialist is a position within the ICS, and is responsible for developing comprehensive sampling plans, directing sampling teams, and coordinating laboratory analysis.

Sampling Specialists within the Spills Program receive intermediate sampling training that adds to the basic curriculum by providing information necessary to collect quantitative samples. Staff that are on the Trustee Resource Assessment and Protection (TRAP) team receive intermediate sampling training and are available via pager to fill the Sampling Specialist role during an incident.

Advanced training is also available to Sampling Specialists and is obtained by attending workshops where participants are specialists within the oil spill industry/community. At these workshops, various sampling issues are discussed with the goal of generating consensus. Intermediate and advanced training and refreshers are conducted on an as-needed basis, typically every two to three years or as required when new staff are added to the program.

9.3. QAPPs

As stated above, Spills are emergencies, and advanced planning is necessarily limited. In light of this, the Spills Program does not generate Quality Assurance Project Plans (QAPPs).

9.4. SOP Status

SPPR has seven SOPs, which are listed in Appendix C. These SOPs are incorporated into the Spills Program Core SOP for Quality Assurance, *CORE 15: Sampling QA/QC*. CORE 15 is located on the Spills internal SharePoint site.

The individual sampling SOPs are also located on the Spills internal SharePoint site.

All seven SOPs are currently in the process of being updated and recertified.

Technical Assistance and QA/QC Support Provided to Spills Program Staff

The sampling training described above includes sections on developing sampling plans and specific QA/QC requirements. Program staff are instructed to contact members of the TRAP team, including Geoff Baran (Program QA Coordinator) Alison Meyers (Sampling Specialist), and Don Noviello (Washington Department of Fish and Wildlife oil spill Sampling Specialist) with *any* questions regarding sampling (one is always available 24/7 by pager). Staff are also encouraged to contact Manchester Environmental Laboratory (MEL) with questions related to oil spill sampling and analysis.

9.5. Audits

There were no audits of the Ecology Spills Program Sampling Procedures during the reporting period.

9.6. QA anomalies and/or corrective actions

After significant spills, program staff involved in the response attend a debriefing to discuss lessons learned, where sampling-related issues are reviewed. Any problems identified are immediately corrected. In addition, debriefs often result in procedural improvements that ensure that data collected are of the highest quality possible.

One such improvement is the creation of a standardized sample-naming convention. Previous guidance documents did not provide samplers with a consistent naming convention for samples collected in the field. This led to samplers using generic sample ID names, which could potentially cause confusion when attempting to interpret sampling results.

With input from the previous QA Coordinator, the Spills Program NRDA lead developed a naming convention that conveys the incident name, sample type, date, and sample number. This naming convention has been added to our *Sampling Guidelines* and *Sampling Documentation Form*, and has been implemented successfully on a number of oil spill incidents. The next revision of the Spills Program SOP *CORE-15: Sampling QA/QC* will incorporate this guidance.

9.7. Planned QA activities

Spills Program plans to continue full implementation of Ecology's quality system in the coming biennium.

10. Toxics Cleanup Program

10.1. Current QA system and activities

Description of FTEs designated to Quality Structure

Fu-Shin Lee is the Toxics Cleanup Program (TCP) QAC and a staff member of the Aquatic Lands Cleanup Unit in Headquarters (HQ). There are at least three FTE TCP staff in the Toxics Cleanup Program that performed the following activities during the reporting period:

- Participated in development of the Sampling Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) for site investigation.
- Identified the data gap and ensured appropriate methods were used to meet the data quality objectives.
- Reviewed and approved SAPs/QAPPs.
- Conducted field sampling audits.
- Reviewed and verified the data reports.

10.2. QA Training

- Professional Development Hub in TCP SharePoint provides training, workshops, a webinar and conference calendar, archived training and meeting information, mentoring, drycleaners cleanup library and resources, and sediment cleanup resources.
- Integrated Site Information System (ISIS) training is continuously offered on an as needed basis. Both individual and group training sessions are offered.
- All TCP staff were given the MyEIM 101 training during April and May of 2016, and continuous one-on-one MyEIM training is given to new staff.
- Northwest Environmental Training Center offered a class on establishing sediment cleanup standards and determining compliance under the Sediment Management Standards on October 16, 2016.
- The first Site Manager University was offered from April 24–25, 2017, to all TCP cleanup managers and technical support staff and will be offered again on regular basis.
- Model Toxics Control Act (MTCA) Site Management 101 — TCP continuously provides classroom training to new and experienced site managers annually, as well as online training all year round. The training provides an overview of MTCA and how to calculate cleanup levels under MTCA.
- TCP staff continue to attend seminars, webinars, conferences and classroom trainings offered by Ecology, EPA, other government agencies, Interstate Technology & Regulatory Council, and consultants like Site Manager University.
- The Sediment Technical and Policy (STP) workgroup held regular technical meetings to communicate key technical and policy issues, ensure consistent and informed decision making, and assist prioritizing policy, guidance, and rule development.

10.3. QAPPs, SOPs, QA Guidance, and Other Publications

- Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion (Implementation Memorandum No. 14), Publication number 16-09-046, March 2016.
- Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings (Implementation Memo No. 18), Publication number 17-09-043, January 2018.
- Frequently Asked Questions (FAQs) Regarding Vapor Intrusion (VI) and Ecology's 2009 Draft VI Guidance (Implementation Memorandum No. 21), Publication number 18-09-046, November 2018.
- DRAFT: Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Publication number 09-09-047, October 2009, revised April 2018.
- UST Walkthrough Inspection Checklist, Publication number 18-09-043, January 2018.
- Sediment Cleanup User's Manual II (SCUM II), Publication number 12-09-057, March 2015, revised December 2017.
- Relationship and Translation of PCB Aroclor and Congener Data — How Useful Are They? Publication number 16-09-080, December 2016.
- Dioxins, Furans, and Dioxin-Like PCB Congeners: Ecological Risk Calculation Methodology for Upland Soil (Implementation Memorandum No. 13), Publication number 16-09-044, July 2016.
- Toxics Cleanup Program Policy 500A: Identification of Potentially Liable Persons, Publication number 16-09-051, May 2016.
- Toxics Cleanup Program Procedure 500A: Identification of Potentially Liable Persons, Publication number 16-09-052, May 2016.
- Remedial Investigation Checklists, Publication number 16-09-006, May 2016.
- Feasibility Study Checklists, Publication number 16-09-007, May 2016.
- Cleanup Action Plan Checklists, Publication number 16-09-008, May 2016.
- Toxics Cleanup Program Policy 840: Data Submittal Requirements, Publication number 16-09-050, April 2016.
- Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion (Implementation Memorandum No. 14), Publication number 16-09-046, March 2016.
- Dioxins, Furans, and Dioxin-Like PCB Congeners: Addressing Non-Detects and Establishing PQLs for Ecological Risk Assessments in Upland Soil (Implementation Memorandum No. 11), Publication number 15-09-048, July 2015.
- Fish Consumption Rates Technical Support Document — Version 2.0, Publication number 12-09-058, January 2013.
- Puget Sound Dredged Disposal Analysis Guidance Manual — Data Quality Evaluation for Proposed Dredged Material Disposal Projects (QA-1), June 1989.

- Data Validation Guidance Manual for Selected Sediment Variables (QA-2), June 1989 Draft.
- Small Business Economic Impact for Chapter 173-360 WAC, Underground Storage Tank Regulations, Publication number 12-09-044, March 2012.
- Underground Storage Tank — Site Check/Site Assessment Checklist, ECY 010-158, March 2015.
- Analytical Methods for Petroleum Hydrocarbons, June 1997.
- Tools for Calculating Cleanup Levels.
- Natural Background — Soil Metals Concentrations in Washington State, October 1994.
- Guidance on Sampling and Data Analysis Methods, January 1995.
- Integrated Site Information System User Manual.

10.4. Current QA Activities

- Worked with the Ecology QA officer to draft the program-specific quality management report.
- Data Quality Assurance (QA) webpage was incorporated in Cleanup Project Managers Toolkit to provide QA policies, guidance, overview, core expectations, and key components of data quality assurance.
- In spring of 2015, the TCP began redeveloping the Integrated Site Information System (ISIS). This application is the repository for TCP's statewide cleanup site information. Project goals are to rethink and rebuild sections, track new measures based on TCP's strategic planning outcomes, adapt to changing technologies, and implement business rules to improve data quality and accuracy. The project was completed in August 2017.
- In fall of 2017, redevelopment of the MyEIM Analysis Tool began. This application serves as an evaluation and verification tool for environmental data submitted by outside parties to TCP, and is integrated with Ecology's EIM Search application to retrieve data to analyze cleanup standards against. Project goals are to make the tool easier and quicker to use, rethink and rebuild sections, remove unused features, create new functionality, and update existing cleanup criteria to the latest standards to assure data quality. Development is ongoing.
- In summer of 2018, TCP is starting requirements gathering sessions for the redevelopment of the Web Reporting Portal. This publicly available website allows for querying core information contained in the ISIS and Underground Storage Tank (UST) information systems.
- EIM data entry training to internal staff and external data submitters was continuously offered by TCP-funded data coordinators.
- In spring of 2017, work on the TCP External Document Submission Portal started. This application allows UST service providers to submit documents electronically to Ecology. By modernizing the current process of requiring hard copies of checklists, the project

streamlines TCP's process of receiving, date stamping, and routing these checklists. The project was completed in summer 2018.

- Due to the UST rule rewrite, TCP is in the process of making mandated enhancements to the UST Information, Department of Revenue Information Exchange, and Inspection Checklist applications. Completion is planned for October 2018.
- What's In My Neighborhood is an application that provides a tool to the public to search and view cleanup sites on a map surrounding a point of interest. This project was completed in 2016.
- Continuously updating TCP's information systems to include Area Wide Remediation Environmental Information System, Smelter Search application, and the Data Storage and Retrieval System, and Generated Site Pages.

10.5. Audits

- Conducted a sediment surface water and clam sampling audit for Keyport Area 8 Marine Tissue/Sediment Evaluation Naval Base Kitsap Keyport on June 6, 2015, and finalized audit report on December 14, 2015.
- Conducted core sediment sampling audit for Anacortes Port Log Yard Remedial Investigation/Feasibility Study on November 18, 2015, and finalized audit report on February 9, 2016.
- Conducted sediment, surface water, and ground water sampling audit for Additional Upland Area Sulfide Sample Collection and Analysis at Weyerhaeuser Mill A Site, Everett on September 7, 2018, and finalized report on October 25, 2018.

10.6. QA anomalies and/or corrective actions

- The EIM data coordinator, project manager, and site-specific technical support specialist performed the data quality check to ensure that the sampling date, analytical method, sample source, appropriate unit, measurement basis, locations, the number of samples and result parameters, and all components used to calculate most derived variables (e.g., dioxin TEQ, cPAH TEQ, PCB as sum of Aroclors, etc.) were submitted according to the QAPP. When data errors or data anomalies were found, the EIM data coordinator informed the data submitter and the project manager. The data submitter would correct and resubmit the data. If there were minor errors, the data coordinator would correct them upon agreement by the EIM data quality coordinator. The EIM data quality coordinators and mangers oversee the TCP EIM data quality.
- Worked with IT staff and design team members to improve EIM data search, mapping, and analysis tools to develop effective ways to review and evaluate data to ensure that complete and correct data are submitted to EIM, and corresponding documents for reviewing EIM data are linked to EIM.

10.7. Planned QA Activities

- Continue to work with agency QA officer and EIM data quality coordinators to resolve the EIM data quality issues encountered during data submittal and review.
- Continue to update the program QA guidance in accordance with the MTCA rule revision effort.
- Redevelopment of EIM data search, mapping, and analysis tools is expected to be completed by 2019, and training will be provided as the tools are updated.
- Sediment Cleanup User's Manual II will be updated once every two years.

11. Water Quality Program

11.1. Current QA system and activities

Environmental data collected by Water Quality Program (WQP) staff, or those under direction of WQ staff (contractor, grantee, permittee), must be credible per Agency Executive Policy 22-01. There are different established quality assurance processes for the various activities in the program. For example, permit development, compliance evaluation, water quality assessments, grant-funded studies, effectiveness studies, and ambient water quality studies all follow distinct but similar processes to assure quality data is collected and stored. The WQP QA Coordinator(s) track the quality activities within the program. The main goal of the QA Coordinators is assist the WQP in ensuring consistent application of QA principles in the program.

- WQP QA Coordinators provide QAPP review and have signature authority to approve QAPPs in WQP. The workflow for QAPP approval in the WQP is divided by the nature of the activity; see section 11.3 below for more details on the approval process.
- The Permit Writers Manual, chapter 2.7, outlines the process for draft permits review for policy conformance and technical accuracy by the Permit Quality Lead. This review ensures conformance with federal and state regulations and policies spanning data quality, methodology, and decision-making. The Permit Quality Lead works with the permit authors and program management regarding policy and process issues.
- Water Quality Assessment is routinely prepared and sent to EPA under sections 303(d) and 305(b) of the Clean Water Act. Water Quality Policy 1-11 is the guiding policy that the program uses to assess water quality data, determine if water bodies are polluted, and decide if further action is needed. This policy also explains data submittal and the data quality necessary for inclusion in a Water Quality Assessment, such as the 303(d) and 305(b) assessment processes. Ecology went through an extensive public review of WQ Policy 1-11 and finalized policy revisions in October 2018. The assessment uses the Watershed Assessment Tracking System database to document decisions based on data from Ecology's EIM system and the federal environmental data portal. Both data systems use data acceptance protocols to ensure the data are representative of the ambient water conditions. Environmental data entered into EIM by the WQP EIM Coordinator must meet data acceptance protocols, and decisions on the status of water bodies entered into the Watershed Assessment Tracking System are verified through internal QC checks, internal staff review, tribal review, public review, and finally an EPA submittal review and approval.
- The WQP maintains permits, manuals, and guidance documents for all aspects of stormwater management including stormwater sampling plans, low-impact development, and runoff control from log yards, airports, and highways. These

documents are made publicly available on Ecology's website.[32] All of the documents are revised, reviewed, and reissued by the WQP at regular intervals. For other point source stormwater and wastewater discharge permit issuance and implementation activities, WQP maintains manuals and guidance documents.[33] WQP maintains a variety of other manuals and guidance documents including but not limited to: criteria for sewage works design, sampling procedures for trace metals, review criteria for wastewater toxicity tests, QAPP templates for temperature and Best Management Practices (BMP) studies, guidance for mixing zone studies, and more. These documents are updated as needed and receive extensive review at each revision.

- The Permitting and Reporting Information System (PARIS) database contains information on water quality permits, inspections, enforcement actions, and discharge monitoring data. Both NPDES and State Waste Discharge permits are included in the database. PARIS contains information on permit management, including permit lists and facility information, discharge monitoring reports (DMRs), water quality permit limits, enforcement actions, and other information. As discussed above, PARIS contains QAPPs prepared by permittees for monitoring activities or studies.
- The WQP initiated the use of the integrated WQWebDMR/PARIS applications in April 2010. There are validation steps in WQWebDMR to increase the quality of the data. Some facilities enter their own data within WQWebDMR, and during the submittal process, the system validates the data and provides the facilities an opportunity to correct data entry errors. Ecology permit managers and enforcement officers continue to review the DMRs for individual permits on a routine basis and look for data entry and calculation errors. If the DMR has an incorrect calculation, Ecology sends it back to the discharger with a request for correction. These automated improvements to permit data entry have increased the quality and efficiency of Ecology's permit management.
- The WQP's WET Coordinator (also a QA Coordinator) reviews all whole effluent toxicity (WET) test reports to make sure that WET tests were conducted in accordance with approved toxicity test methods and that results met test acceptability criteria. WET test results are also examined for a meaningful concentration-response relationship so that anomalous results can be excluded from regulatory decisions. Ecology Publication WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*,[34] describes expectations for WET testing and reporting.
- The Technology Assessment Protocol — Ecology[35] (TAPE) is a stormwater BMP review and certification program overseen by Ecology. Vendors, designers, or manufacturers

[32] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources

[33] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance

[34] https://fortress.wa.gov/ecy/publications/documents/9580.pdf

[35] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

submit proposals, QAPPs, and eventually data to have their stormwater treatment technology reviewed and certified by the agency. The Board of External Reviewers reviews the QAPPs, and the designee TAPE manager at UW provides QAPP approval.

- The Financial Assistance Section awards multiple grant types and low-interest loans for projects intended to improve water quality. Sampling of water quality is rarely included in stormwater grant projects anymore due to the formation of Stormwater Action Monitoring (SAM). Non-point projects and Stormwater Grants of Regional or Statewide Significance are the grant types that may include sampling at the recipient's request. If so, a QAPP is developed per grant and loan requirements and reviewed for approval by EAP staff through the joint EAP/WQP Procedure 2-03.
- Washington's National Estuary Program, an EPA funded program to improve Puget Sound water quality and habitat, is operated by WQ and Environmental Assessment staff at Ecology. Funded studies that collect monitoring data receive QAPP review from a dedicated NEP QA reviewer in the program. There is a formalized QA process[36] at Ecology for study grant recipients to follow.
- Stormwater Action Monitoring program is the collaboratively supported monitoring program formed under the Phase I and II municipal general permits. Ecology is the administrator of the program and provides QA review of all the studies.
- Environmental data (not BMP data) gathered by WQP are stored in the agency Environmental Information Management (EIM) database or the PARIS database. Data bound for EIM or submitted to Ecology for the biennial Water Quality Assessment are managed by the WQP EIM Coordinator. The PARIS and EIM coordinator works with regional permit managers and data submitters and screens data for validity and intended use. If appropriate, BMP data is stored in the International BMP database.

FTEs Designated to Quality Assurance in the Water Quality Program

Estimating FTEs conducting quality assurance functions in the WQP is difficult due to the broad and distributed nature of the QA work. There are no dedicated staff with only quality assurance job descriptions, but at least a dozen different staff ensuring conformance with our program procedures and functions related to QA, including QA Coordinator(s), Permit Quality Lead, multiple permit writers workgroups, WET testing expert, IT support, assessment workgroups, EIM Coordinator, and regional QAPP review. Because QA activities are diffused throughout the WQP, any estimate of overall staff time must be considered approximate. Each bullet item above has several staff with various percentages of their work assigned to review of WQP products, databases, and studies. The WQP QA Coordinators participate in the Agency QA workgroup to assist with coordination across the agency.

[36] https://ecology.wa.gov/About-us/How-we-operate/Scientific-services/Quality-assurance/Quality-assurance-for-NEP-grantees

11.2. QA Training

In addition to Ecology QA requirements and guidance documents, the WQP maintains certain program-specific QA documents and workgroups (approximately 15 working groups — see Appendix A of the WQP Charter) to guide staff in implementing QA activities (e.g., Permit Writers Workgroups, TMDL, Water Quality Assessments, NEP, and Grants). Many of the working groups develop training procedures, and meetings often involve training; some working groups meet monthly. FMS, for example, will provide training for new grant managers on all aspects of their job that will include ensuring QAPPs (if needed) get approval. WQP staff attend QA training when available and provided by the QAO.

11.3. QAPPs

QAPPs describe a study question, study objectives, and a plan to gather data of the appropriate quality to meet the objective. The WQP activities that require development of a QAPP are studies—generally when environmental and technology evaluation data are being collected for decision-making purposes. Examples include TMDL development, non-point stormwater data collection, stormwater discharge characterization and impacts studies, stormwater BMP treatment and effectiveness studies, evaluation of non-permitted parameters, and suitability of testing or treatment technologies for use in permits. The WQP QAPPs are sometimes required via permits for new information (where a study question is different than permit compliance). Permit development and compliance sampling are rarely considered studies and follow the protocols detailed in the Permit Writers' Manual. Inspection or sampling for permit compliance is not a study, so a QAPP is not needed.

For studies that require sample collection, staff are required to develop QAPPs and get reviews and approval from QA coordinators. QAPPs written by WQP, or those under direction of WQ staff (e.g., contractors, grantees, or permittees), follow the Ecology QAPP guidelines and use the QAPP template to conform with Agency Executive Policy 22-01.

The workflow for QAPP approval in the WQP is divided by the nature of the activity:

- National Estuary Program (NEP): QAPPs for NEP projects are reviewed and approved by the NEP coordinator in EAP.
- Financial Management Section HQ and Regions for grant-funded studies: In 2004, FMS developed a policy with EAP for review and approval of QAPPs developed for grant-funded studies. See EAP/WQP Policy 2-03. There are very few studies funded by FMS that require QAPPs anymore.
- Watershed Management Section HQ and Regions for TMDLs: All TMDL studies developed by the WQP are reviewed by EAP; there are only a few WQP staff conducting this work themselves as most of this work is in EAP.
- Permit Development Section HQ and Regions: WQP QACs provide review and approval for QAPPs required by permits and those developed for SAM. All municipal stormwater general permit QAPPs are reviewed; this includes QAPPs for SAM, Phase I and II

permits, and WSDOT. All other QAPPs (like those for non-point sampling, toxicity, and determining effluent limits) are also reviewed and approved by the WQP QACs.

Only a few QAPPs are authored by the WQP for environmental and effectiveness studies; these QAPPs are published following Ecology's publication process. QAPPs authored by permittees, grant recipients, or by legal order are not published by Ecology.

Permit-required QAPPs are approved, tracked, and maintained in the Permitting and Reporting Information System[37] (PARIS) within the list of documents submitted by each permittee. Non-point studies are reviewed by the regional offices. Most permit-required QAPPs are reviewed by project leads (who may or may not be regional staff) and then approved by one of the QACs (two staff at HQ). The processes for QAPP review and approval are being updated.

11.4. SOP Status

The WQP has four SOPs (listed in Appendix C) for sampling stormwater discharges. They are published under the following publication numbers: 18-10-023, 18-10-024, 18-10-025, 18-10-026. The links are listed on the Quality Assurance[38] webpage. These SOPs are for grab or automated sampling of stormwater, passive in-line sampling for stormwater solids, and for calculating stormwater loads from discharges.

11.5. Audits

EPA performed a routine Permit Quality Review audit[39] in 2016. They commended the quality of Ecology's WQP permits. Ecology easily satisfied the few Category 1 (most critical) findings.

11.6. QA anomalies and/or corrective actions

WQP's two QACs are not aware of any problems or issues.

11.7. Planned QA activities

All current activities (listed in section 11.1) are ongoing and will continue into the next reporting period. The WQP QACs are working with managers and staff to capture, in a flow chart, the existing QA procedures in the program. WQP Policy 2-01 on EIM procedures will be updated in 2019 to better reflect roles and responsibilities.

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[37] https://fortress.wa.gov/ecy/paris/PermitLookup.aspx

[38] https://ecology.wa.gov/About-us/How-we-operate/Scientific-services/Quality-assurance/

[39] https://www.epa.gov/sites/production/files/2017-09/documents/npdes_pqr_washington_june_2017.pdf

12. Water Resources Program (WRP) and Office of Columbia River (OCR)

12.1. Current QA System and Activities

Water Resources Program (WRP) and Office of Columbia River (OCR) ensure data quality associated with several categories of work, including:

- Data collected directly by WRP.
- Data collected by recipients of grants issued by WRP and OCR.
- Data collected to support WRP permitting and/or enforcement of water rights.

The most common types of data collected by WRP/OCR are depth-to-water measurements in wells and streamflow. Grant-funded external projects may include in situ measurements and sampling for analysis of various water quality parameters. WRP regional and headquarters staff follow established protocols when collecting groundwater data to achieve documented quality objectives. In 2017, WRP published its Integrated Statewide Groundwater Monitoring Strategy. That strategy document includes a Groundwater Monitoring Quality Assurance Monitoring Plan (QAMP) as well as several interim SOPs (see list below). WRP conducted a training session on how to implement the QAMP and the SOPs in September 2017 and September 2018.

Each year, the WRP and OCR issue numerous grants, mostly to local governments and organizations. QA staff need to determine whether the funded projects will involve monitoring activities or collecting environmental samples. If a project will collect environmental measurements, with no water quality sampling, a Quality Assurance Project Plan (QAPP) may be developed using program-specific guidance (WRP Publication No. 17-11-013).[40] If a project will collect water quality samples then QAPPs are developed based on Ecology's Guidelines and Specifications for Preparing Quality Assurance Project Plans for Environmental Studies (EAP Publication No. 04-03-030).[41] Once the project is complete, WRP or OCR project managers and grantees must submit data to Ecology's Environmental Information Management system (EIM). The WRP established an EIM data coordinator position in conjunction with Ecology's Environmental Assessment Program (EAP) in December 2017 to facilitate the submittal of data into the EIM system.

Data collected in support of the permitting of water rights is authorized and dictated through a preliminary permit specifying how fieldwork must be conducted. These documents are developed based on WRP regional templates for specific types of work (e.g., pumping and well testing).

[40] https://fortress.wa.gov/ecy/publications/SummaryPages/1711013.html

[41] https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html

Status of WRP's Quality System

WRP has one employee, Matt Rakow, with a position description that includes QA activities. This position allots 0.25 FTE for QA activities are and 0.75 FTE for overseeing a comprehensive groundwater monitoring strategy. Within the OCR, Michael Callahan's position description features "up to five percent duties as assigned." This includes review and approval of QAPPs submitted to OCR by grantees and contractors.

WRP/OCR staff have historically reviewed and approved only a limited number of QAPPs each year. Staff have also found it difficult to apply existing agency QAPP guidance to typical WRP projects. However, the WRP has since developed program-specific QAPP guidance (WRP Publication No. 17-11-013)[42] that is better suited to most projects funded by WRP/OCR.

The two programs combined expect to receive 10–15 QAPPs annually. All QAPPs will be peer reviewed. QAPPs related to RCW 90.94 that are received by the WRP will be reviewed by Matt Rakow. Other WRP QAPPs will be reviewed by Matt Rakow. All WRP QAPPs will be approved by the WRP QAC. QAPPs received by OCR will be reviewed and approved by Michael Callahan. The QA Officer may be asked to assist with QAPP review and/or approval.

12.2. QA Training

- September 2017 — Field staff training
- September 2018 — Grant manager training

12.3. QAPPs

The following QAPP was reviewed and approved:

- April 2017 — Groundwater Monitoring Quality Assurance Monitoring Plan (QAMP)

12.4. SOPs

February 2017 — Nine SOPs were reviewed and approved as part of publishing the Water Resources' Groundwater Monitoring Quality Assurance Monitoring Plan (WRP Publication No. 17-11-005).[43] These SOPs are listed in Appendix C.

[42] https://fortress.wa.gov/ecy/publications/SummaryPages/1711013.html

[43] https://fortress.wa.gov/ecy/publications/documents/1711005.pdf

12.5. Audits

Beyond the agencywide audit conducted by the EPA, Water Resources was not required to conduct any internal audits.

12.6. QA anomalies and/or corrective actions

None to report.

12.7. Planned QA activities

Water Resources will conduct a training session for all the Streamflow Restoration planners in the program. The planners will be in charge of managing Streamflow Restoration grant contracts starting in 2019. The focus of the training will be to familiarize the planners with the agency QA mission, the Water Resources program-specific QAPP guidance and template, and the standard QAPP guidance for instances where water quality monitoring is needed.

REFERENCES AND READINGS

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APPENDICES

APPENDIX A. ACRONYMS AND ABBREVIATIONS

PROGRAMS OF THE DEPARTMENT OF ECOLOGY

AQ	Air Quality
EAP	Environmental Assessment Program
LAU	Lab Accreditation Unit
MEL	Manchester Environmental Laboratory
HWTR	Hazardous Waste and Toxics Reduction
NW	Nuclear Waste
SEA	Shorelands and Environmental Assistance
OCB	Office of Chehalis Basin
Spills	Spill Prevention, Preparedness, and Response
TCP	Toxics Cleanup
W2R	Waste 2 Resources
WQ	Water Quality
WR	Water Resources
OCR	Office of Columbia River

REGIONAL OFFICES OF THE DEPARTMENT OF ECOLOGY

HQ	Headquarters, Olympia / Lacey
CRO	Central Regional Office, Union Gap
ERO	Eastern Regional Office, Spokane
NWRO	Northwest Regional Office, Bellevue
SWRO	Southwest Regional Office, Olympia / Lacey

OTHER ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
DWCO	Drinking Water Certification Officers
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management system
ELAP	Environmental Laboratory Accreditation Program (for LAU)
EPA	U.S. Environmental Protection Agency
FTE	Full Time Equivalent
FY	Fiscal Year
GIS	Geographic Information System
IDC	Initial Demonstration of Capability
ISIS	Integrated Site Information System (TCP)
JHD	Jurisdictional Health Departments
LO	Lead Organization
MDL	Method Detection Limit
MEL	Manchester Environmental Laboratory (part of EAP)
NEP	National Estuary Program
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resource Damage Assessment
PBMS	Performance-Based Measurement Systems
PT	Proficiency Testing
QA	Quality Assurance
QAC	Quality Assurance Coordinator
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCW	Revised Code of Washington
SAP	Sampling Analysis Plan
SOP	Standard Operating Procedure
TMDL	Total Maximum Daily Load (water cleanup plan)
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WET	Whole Effluent Toxicity

Appendix B. Ecology Quality Assurance Coordinators

Agency Program	Program Manager	QA Coordinator	Location	Phone	Email
QA Officer		Arati Kaza	HQ	(360) 407-6964	arati.kaza@ecy.wa.gov
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[1] Kathy Taylor, Deputy AQP Manager
[2] EAP = Environmental Assessment Program
[3] HWTR = Hazardous Waste and Toxics Reduction

APPENDIX C. CURRENT ECOLOGY SOPS (THROUGH JUNE 2018)

1. AIR QUALITY PROGRAM

Index Number	SOP Title	Status
	Air Monitoring Documentation, Data Review, and Validation Procedure	Current
	Air Monitoring Project Approval, Site Selection, and Installation Procedure	Current
	Air Toxics Monitoring Procedure	Current
	M903 Nephelometer Procedure	Current
	Ecotech Nephelometer Procedure	Current
	Gaseous Monitoring Procedure (CO, NO_2, NOy, SO_2)	Current
	Ozone Monitoring Procedure	Current
	E-Sampler Monitoring Procedure	Current
	$PM_{2.5}$ and PM_{10} Sequential Sampler Procedure	Current
	$PM_{2.5}$ and PM_{10} Beta Attenuation Monitor Operating Procedure	Current
	PM_{10} Tapered Element Oscillating Microbalance Procedure	Current
	$PM_{2.5}$ Tapered Element Oscillating Microbalance with Filter Dynamic Measurement Operating Procedure	Current
	Ultrasonic Meteorological Monitoring Procedure	Current

2. Environmental Assessment Program — Field and Sampling

Index Number	SOP Title	Status
EAP001	Use of Semi-Permeable Membrane Devices	Current
EAP003	Pesticide Sampling in Fresh Water	Current
EAP007	Resecting Finfish Whole Body, Body Parts or Tissue Samples	Current
EAP008	Resecting DNA Samples and Aging for Finfish	Current
EAP009	Collection, Processing and Preservation of Finfish Samples	Current
EAP011	Instantaneous Measurement of Temperature in Water	Current
EAP015	Grab Sampling – Fresh Water	Current
EAP018	Turbidity Threshold Sampling	Current
EAP019	Estimating Stream Flows Using a Flume	Current
EAP023	Winkler Determination of Dissolved Oxygen	Current
EAP024	Estimating Streamflow	Current
EAP025	Seawater Sampling	Current
EAP026	Analysis of Chlorophyll a	Current
EAP027	Seawater Dissolved Oxygen Analysis (Dosimat)	Current
EAP028	Reagent Preparation	Current
EAP029	Metals Sampling	Current
EAP030	Fecal Coliform Sampling	Current
EAP031	Collection and Analysis of pH Samples	Current
EAP032	Collection and Analysis of Conductivity Samples	Current
EAP033	Hydrolab DataSonde and MiniSonde Multiprobes	Current
EAP034	Collection, Processing, and Analysis of Stream Samples	Current
EAP037	Time of Travel Dye Studies	Current
EAP038	Collection of Fresh Water Sediment Cores	Current
EAP039	Obtaining Marine Sediment Samples	Current
EAP040	Obtaining Fresh Water Sediment Samples	Current
EAP041	Collecting Freshwater Suspended Particulate matter samples using in-line filtration	Current
EAP042	Stream Stage Height Determination	Current
EAP043	Benthic Infaunal Rescreening, Tracking, Sorting and Taxonomic Identification	Current
EAP044	Continuous temperature monitoring of fresh water rivers and streams	Current
EAP045	Hemispherical digital photography conducted for a temperature TMDL study	Current
EAP046	Analysis of hemispherical digital photography conducted for a temperature TMDL study	Current
EAP050	Marine Currents using ADCPs (Acoustic Doppler Current Profilers)	Current
EAP052	Manual Depth-to-Water Level Measurements	Current
EAP055	Use of StreamPro Acoustic Doppler Current Profiler	Current
EAP056	Measuring and Calculating Stream Discharge	Current
EAP057	Conducting Stream Hydrology Site Visits	Current
EAP058	Operation of SonTek® FlowTracker® Handheld ADV®	Current
EAP059	Operation of Mechanical Velocity Indicators	Current
EAP060	Measuring Stream Discharge from a Bridge	Current

Index Number	SOP Title	Status
EAP061	Installing, Monitoring, and Decommissioning hand-driven, in-stream Piezometers	Current
EAP064	Determining Canopy Closure using a Concave Spherical Densiometer - Model C	Current
EAP070	Minimizing the Spread of Aquatic Invasive Species from areas of Extreme Concern	Current
EAP072	Basic use and maintenance of Design Analysis® Data Loggers and Peripheral Equip.	Current
EAP073	Collection of Freshwater Benthic Macroinvertebrates in Streams and Rivers	Current
EAP074	Use of Submersible Pressure Transducers during Groundwater studies	Current
EAP075	Measuring Vertically Averaged Salinity	Current
EAP077	Sampling Drinking water wells	Current
EAP078	Sampling monitoring wells	Current
EAP079	SPMD data reduction	Current
EAP080	Continuous Temperature Monitoring of fresh water rivers and streams	Current
EAP081	Tagging Wells	Current
EAP082	Correction of Continuous Stage Records	Current
EAP084	Conducting Riparian Vegetation and Stream Channel Surveys in Wadeable Streams for Temperature Total Maximum Daily Load Studies	Current
EAP085	Collection of Periphyton Samples for TMDL studies	Current
EAP086	Marine Waters Sensor Performance Assessment - Lab Procedure	Current
EAP087	Marine Waters Sensor Performance Assessment - Field Procedure	Current
EAP088	Marine Waters Data Quality Assurance and Quality Control	Due
EAP090	Decontamination of Sampling Equipment for Toxics Sampling	Current
EAP091	Operation of fluorometer for the field determination of optical brighteners	Current
EAP092	Sampling Bacteria for BEACH Program	Current
EAP095	Collecting Samples for the Watershed Health Monitoring Program	Current
EAP096	Sampling General Chemistry in Water Supply Wells	Current
EAP097	Collection of Longitudinal Stream Depth Profiles	Current
EAP098	Collecting Groundwater Samples for Metals Analysis from Water Supply Wells	Current
EAP099	Sampling General Chemistry in Monitoring Wells	Current
EAP100	Sampling Metals in Monitoring wells	Current
EAP104	Victoria Ferry Operations	Current
EAP105	Off-season GIS for Wide Protocol	Current
EAP106	Site Verification and Layout	Current
EAP107	Measuring Transect Coordinates with a Global Positioning System (GPS)	Current
EAP108	Collecting In-situ Water Quality	Current
EAP109	Estimating Stream Discharge (Narrow Protocol)	Current
EAP110	Sample Sediment for Chemistry	Current
EAP111	Periphyton Sampling, Processing and Identification in Streams and Rivers	Current
EAP112	Bank Erosion Vulnerability	Current
EAP113	Measuring Channel Dimensions	Current
EAP114	Estimating Substrate Sizes and Embeddedness at Major Transects	Current
EAP115	Riparian Cover by Densiometer	Current
EAP116	Fish Cover	Current

Index Number	SOP Title	Status
EAP117	Riparian Vegetation Structure	Current
EAP118	Visual Assessment of Human Influence	Current
EAP119	Thalweg Profiling	Current
EAP120	Quantifying Habitat Units	Current
EAP121	Counting Large Woody Debris	Current
EAP122	Narrow Slope	Current
EAP123	Measuring Compass Bearings (Narrow Protocol)	Current
EAP124	Vertebrate Assemblage Sampling	Current
EAP125	Managing Electronic Data Form Functionality using Mobile Data-Collection Device	Current
EAP126	Benthic Macrofaunal Size Classification and Biomass Analysis	Current
EAP128	Standardization of Benthic Taxonomy	Current

3. EAP — LAB ACCREDITATION UNIT

Index Number	SOP Title	Status
LAU001	Assessment (Audit) of Environmental Laboratories	Current
LAU002	Accreditation of Environmental Laboratories	Current
LAU003	Renewal Applications	Due

4. EAP — MANCHESTER ENVIRONMENTAL LABORATORY (MEL)

Index Number	SOP Title	Status
	Microbiology	
710001	%KES Membrane Filter Technique, G. Jay Vasconcelos, EPA Region 10 Microbiologist, "The Detection and Significance of Klebsiella in Water", Modified	Unknown
710005	Use of Autoclave for Sterilization	Unknown
710013	Microbiology Dishwasher	Unknown
710014	Escherichia coli Detection by Most Probable Number, EPA 1104	Unknown
710015	Escherichia coli Detection Membrane Filter Technique, EPA 1105	Unknown
710017	Enterococcus in Water by Most Probable Number, Standard Method 9230 B	Unknown
710018	Fecal Coliforms Membrane Filter Technique, Standard Method 9222 D, Modified	Unknown
710019	Fecal Coliforms by Most Probable Number, Standard Method 9221 E	Unknown
710021	Fecal Coliforms in Water by Most Probable Number, Standard Method 9221 E	Unknown
710022	Fecal Streptococcus Membrane Filter Technique, Standard Method 9230 C	Unknown
710039	Total Coliforms Membrane Filter Technique, Standard Method 9222 B, Modified	Unknown
710042	Total Coliforms in Water by Most Probable Number, Standard Method 9221 B, Modified	Unknown
710073	Fecal Coliforms in Water by Most Probable Number Using A-1 Media, Standard Methods 9221 E-2	Unknown
710075	Heterotrophic Plate Count & Nuisance Organisms Iron & Sulfate	Unknown
710076	EPA Method 1600: Membrane Filter Test Method for Enterococci in Water	Unknown
710079	Total Nonvolatile Solids (Fixed) and Volatile Solids ignited at 550^{O}C, Standard Method 2540 E	Unknown
710081	pH, Microbiology	Unknown
710083	Membrane Filter Test Method for Escherichia coli in Water (mTEC2), EPA Method 1103.1	Unknown
710084	Microbiology Quality Assurance Procedures	Unknown
710089	COLILERT®-18 IDEXX	Unknown
	General and Physical Chemistry	
710002	Alkalinity, SM 2320B	Unknown
710004	Ash Free Weight, SM 10300 C, Modified	Unknown

Index Number	SOP Title	Status
710007	Biochemical Oxygen Demand Using the Dissolved Oxygen Probe EPA Method 415.1	Unknown
710008	Fluoride/Chloride/Sulfate by Ion Chromatography, EPA Method 300.0	Unknown
710009	Conductivity, SM 2510B	Unknown
710012	Fluorometric Determination of Chlorophyll *a* in Saltwater and Freshwater Samples, Standard Method 10200 H, Modified	Unknown
710028	Total and Dissolved Organic Carbon EPA Method 415.1 (Combustion and NDIR Detection)	Unknown
710029	Ammonia (phenolate) Method by Colorimetric Flow Injection Analysis, SM 4500-NH3 H	Unknown
710030	Nitrogen, Nitrate-Nitrite, SM 4500-NO3 I, Modified (Colorimetric, Automated, Cadmium Reduction)	Unknown
710031	Nitrogen, Nitrite, SM 4500-NO_3 I, Modified (Colorimetric, Automated)	Unknown
710032	Oil and Grease EPA Method 1664: N-Hexane Extractable Material (HEM; Oil and Grease), by extraction and Gravimetry, Modified	Unknown
710033	Orthophosphate in Waters by Colorimetric Flow Injection Analysis, SM 4500 P G	Unknown
710034	pH (Electrometric), EPA Method 150.1	Unknown
710038	Settleable Solids (Settleable Matter), SM 2540 F	Unknown
710043	Total Dissolved Solids (Residue, Filterable), SM 2540 C	Unknown
710045	Percent Total Solids, Percent Volatile Solids and Percent Nonvolatile (fixed) Solids in Solid and Semisolid Samples, SM 2540 G, Modified	Unknown
710046	Total Non-Volatile Suspended Solids (Residue, Volatile), SM 2540 E, Modified	Unknown
710047	Total Solids, SM 2540 B	Unknown
710048	Total Nitrogen in Waters by Colorimetric Flow Injection Analysis, Standard Method 4500-N B.	Unknown
710052	Total Suspended Solids (Residue, Non-Filterable), SM 2540 D, Modified	Unknown
710054	Turbidity, SM 2130 B, Modified	Unknown
710055	Ultimate Biochemical Oxygen Demand (UBOD)	Unknown
710056	Analysis of Bulk Asbestos, Federal Register, 40 CFR 763, Appendix A to Subpart F, Modified	Unknown
710057	Asbestos Fiber Counting by the NIOSH 7400 Method, Modified	Unknown
710058	Gravimetric Analysis of High Volume Air Filters, Federal Register, 40 CFR 50, Appendix J, Modified	Unknown
710068	Soil and Waste pH Electrometric SW846 Method 9045C	Unknown
710070	Total Organic Carbon in Soil/Sediment, PSEP-TOC	Unknown
710074	Low level Total Phosphorus by Manual Digestion and Lachat	Unknown
710078	Gravimetric Analysis of $PM_{2.5}$ Fine Particulate Air Filters, Federal Register, 40 CFR 50, Appendix L, Modified	Unknown
710079	Total volatile and non-volatile solids, SM2540E	Unknown
710080	Percent Total Solids for TOC PSEP samples at 70 °C and 104 °C	Unknown

Index Number	SOP Title	Status
710085	Suspended Sediment Concentration; ASTM Method D3977-97 (re-approved 2002), Test Method B - Filtration	Unknown
710086	Alkalinity in Seawater; Fisheries Research Board of Canada; Bulletin 167, Second Edition, I.4.I.2	Unknown
710087	Ash Free Dry Weight in Macrophyton, SM 10300 C, Modified	Unknown
710088	Conductivity in Seawater	Unknown
	Metals	
720002	Metals Water Sample Preparation, EPA Method 200.2	Unknown
720009	Determination of Mercury in Water by Cold Vapor Atomic Absorbance, U.S. EPA Methods 245.1, Modified and SW846 7470, Modified	Unknown
720011	Metals Low Level Cold Vapor Mercury Analysis of Water Samples Using Bromine Oxidation, U.S. EPA Method 245.7, Modified	Unknown
720012	Metals Sediment Sample Preparation by Hotblock Digestion, SW846 Method 3050B, Modified	Unknown
720013	Metals Water Sample Preparation, EPA Method 3010A	Unknown
720015	Sediment Preparation by Microwave Digestion, SW846 Method 3051	Unknown
720016	Toxicity Characteristic Leaching Procedure for Metals SW846 Method 1311	Unknown
720018	ICP Mass Spectrometer VG PQ ExCell, EPA Method 200.8	Unknown
720021	Determination of Mercury by Cold Vapor Atomic Absorbance in Sediment, SW846 7471 Modified, and EPA Method 245.5, Modified	Unknown
720022	Solid Preparation by Microwave Digestion, SW846 Method 3052	Unknown
720024	Low Level Phosphorus by ICP-MS, EPA Method 200.8	Unknown
720025	Metals Water Sample Preparation, EPA Method 3010A	Unknown
720026	Metals Water and Aqueous Waste Sample Preparation for Analysis by ICP/MS, EPA SW-846 Method 3020	Unknown
720027	Determination of Mercury by Cold Vapor Atomic Absorbance in Tissues by EPA SW-846 Method 7471B, Modified, and EPA Method 245.6, Modified	Unknown
720028	Solid Sample Preparation for Phosphorus, Method 200.2	Unknown
720029	ICP: 715-EIS, EPA Method 200.7	Unknown
720030	Metal Analysis of Air Filters, Federal Register, 40 CFR 50, Appendix G, Modified	Unknown
	Organics	Unknown
730002	Analysis of Water/Soil/Sediment/Fish Tissue Samples for Organochlorine Pesticides and Polychlorinated Biphenyls by GC/ECD SW846, Methods 8081 and 8082	Unknown
730005	Butyltin Analysis	Unknown
730009	Determination of Percent Lipids in Tissue	Unknown
730013	Analysis of Chlorinated Acid Herbicides from Soils and Sediments (EPA Method 8151B)	Unknown
730021	Semivolatile Base/Neutral/Acid (BNA) Organic Compounds by Gas Chromatograph Mass Spectrometer (GC/MS): Capillary Column	Unknown
730022	GC/MS Data Final Review	Unknown
730028	Hydrocarbon Identification	Unknown
730061	Volatile Organic Analysis - Method 8260A	Unknown

Index Number	SOP Title	Status
730066	Analysis of WTPH-D_x Semivolatile Petroleum Products in Environmental Soil, Sediment and Water Extracts	Unknown
730067	Analysis of NWTPH-G_x and BTEX Analysis Methods for Soil and Water	Unknown
730070	Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography/Selective Ion Monitoring Mass Spectroscopy (GC/SIM-MS)	Unknown
730072	Extraction of Fish Tissue for Semi-Volatile Analytes, including Pesticides, PCBs and BNAs by GC/ECD and/or GC/MS	Unknown
730073	Fish Tissue Florisil Column and Acetonitrile Back Extraction Cleanup (Macro)	Unknown
730080	Extraction and GC/MS Analysis of 1-Naphthol and Carbaryl in Soil/Sediment	Unknown
730081	Accelerated Solvent Extraction of Solid Samples	Unknown
730082	Determining Flash Point by Pensky – Martens Closed Cup Tester	Unknown
730083	Isotopic Dilution Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography/Selective Ion Monitoring Mass Spectrometry (GC/ID-SIM-MS)	Unknown
730085	Extraction of PAH only, Pesticides and/or PCBs in Water	Unknown
730087	Butyltin in Tissue Analysis	Unknown
730088	Sulfur Removal by SW-846 Method 3660B	Unknown
730091	Micro-Florisil® Column Cleanup	Unknown
730092	Micro-Florisil® Cleanup for Phthalate Esters, by Method 3620B	Unknown
730093	Acid-Base Partition Cleanup, by Method 3650B	Unknown
730095	Herbicide Analysis by Gas Chromatography/Mass Spectrometry (GC/MS)	Unknown
730096	PBDE Tissue Analysis by GC/MS/MS	Unknown
730097	Analyzing Chlorinated, Organophosphorus, and Nitrogenous Pesticides by GC/MS, Method 8270	Unknown
730098	Methoprene by GC/MS, USGS Method O-2134-01	Unknown
730099	Solid Phase Extraction (SPE) of Semi-Volatile Petroleum Products (NWTPH-Dx) in Water by EPA SW-846 Method 3535	Unknown
730100	Solid Phase Extraction (SPE) of Herbicides in Water by EPA SW-846 Method 3535	Unknown
730101	Extraction of BNA's/Pesticides/PCB's/Op-Pesticides in Soils, Sediments and Sludges by Soxtherm, SW 846 Method 3541	Unknown
730103	Micro-acetonitrile back extraction cleanup	Unknown
730104	PBDE Analysis by GC/MS Selective ion Monitoring (SIM)	Unknown
730105	Fish Tissue Florisil Column and Acetonitrile Back Extraction Cleanup (Micro)	Unknown
730107	Solid Phase Extraction (SPE) of Pesticides in Water by EPA SW-846 Method 3535	Unknown
730108	Solid Phase Extraction (SPE) of PBDEs in Water by EPA SW-846 Method 3535	Unknown
730109	Alcohol Analysis, EPA SW-846 Method 8015C	Unknown
730110	Soxtherm semivolatile tissue extraction	Unknown
730111	Analyzing Chlorinated, Organophosphorous, and Nitrogenous Pesticides by GC/MS/MS, Method 8270D	Unknown
730112	Solid Phase Extraction (SPE) of Polynuclear Aromatic Hydrocarbons (PAH) in Water by EPA SW-846 Method 3535A	Unknown

Index Number	SOP Title	Status
730113	Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography/Selective Ion Monitoring Mass Spectrometry (GC/SIM-MS), Method 8270D	Unknown
730114	Carbamate Analysis by LC/MS/MS Double Quadrupole, EPA Method 8321A Modified	Unknown
730115	Carbamate Analysis by LC/MS/MS Triple Quadrupole, EPA Method 8321A Modified	Unknown
730117	SPMD Spiking Instructions	Unknown
730118	Herbicide extraction in soil	Unknown
730119	Acid/Base Partitioning Cleanup for Herbicide Analysis by EPA SW-846 Method 3650B	Unknown
	Sample and Data Management	
770001	Sample Check-In	Unknown
770003	Purchasing Analytical Services	Unknown
770005	Reviewing Contract Laboratory Data	Unknown
770009	Filling Sample Container Orders	Unknown
770014	Processing Purchases for Payment	Unknown
770016	Radiation Screening of Samples Entering MEL	Unknown
770017	Sample Data Filing System	Unknown
770018	Documentation of Administrative Standard Operating Procedures	Unknown
770019	Documentation of Analytical Standard Operating Procedures	Unknown
770020	Use of the OHS Material Safety Data Sheets on CD/ROM Software	Unknown
770023	Waste Collection, Storage and Pickup	Unknown
770026	Sample Disposal	Unknown
770029	Cleaning Sample Containers with a Laboratory-Grade Dishwasher	Unknown
770030	Operation of Ecology Laboratory Balances	Unknown
770031	Calibration of Temperature Probes and Thermometers	Unknown
770032	Personnel Training	Unknown
770033	Personnel Training in Peer Review of Data	Unknown
770034	Maintenance of Adjustable Pipettes	Unknown
770035	QA of Analytical Standards	Unknown
770036	Radiation Protection Plan	Unknown

SM = Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998.
Unless otherwise indicated, all lab SOPs are final.

5. Hazardous Waste and Toxics Reduction Program

SOP Number	SOP Title	Status
PTP001	Standard Operating Procedure for Consumer Product Sample Collection and Processing,	Current
PTP003	Standard Operating Procedures the Operation of the Thermo Fisher Scientific Niton XL3t 700 X-ray Fluorescence Analyzer (XRF).	Current

6. Nuclear Waste Program

SOP Number	SOP Title	Status
NWP001	Standard Operating Procedure for Collecting Samples at Hanford Nuclear Reservation	Due
NWP002	Standard Operating Procedure for Shipping Samples to the Nuclear Waste Program Contracted Analytical Laboratories	Due

7. Shorelands and Environmental Assistance Program

SOP Number	SOP Title	Status
SEA001	Field Verification of Remotely Sensed Wetland Maps	Current
	Monitoring Wetlands Mitigation Compliance-Datasheets	Due
	Monitoring Wetlands Mitigation Compliance-Checklists	Due

8. Solid Waste Management Program (formerly Waste 2 Resources Program)

SOP Number	SOP Title	Status
	Water Discharge Monitoring Report Review.	Current
	Air Monthly Report Review/Compliance Monitoring Spreadsheet Tracking.	Current
	Water Discharge Permitting Process from Application to Issuance.	Current
	Enforcement procedures.	Current
	Air permitting from application to issuance.	Current
	Inspections and reporting.	Current
	Wastewater sampling	Current

9. Spills Program

SOP Number	SOP Title	Status
SPL001	Collecting oil spill source samples	Due
SPL002	Collecting oil spill HCID samples	Due
SPL003	Collecting oil spill water samples	Due
SPL004	Collecting oil spill intertidal sediment samples	Due
SPL005	Collecting oil spill shellfish tissue samples	Due
SPL006	Collecting soil or sediment samples for gasoline spills	Due
SPL007	Collecting samples from fish kills	Due

10. Toxics Cleanup Program

SOP Number	SOP Title	Status
TCP001	Standard Operating Procedures for Field Audits at Field Activities Overseen by TCP Staff	Current

11. Water Quality Program

SOP Number	SOP Title	Status
ECY001	Collecting Grab Samples from Stormwater Discharges	Current
ECY002	Automatic Sampling for Stormwater Discharges	Current
ECY003	Collecting Stormwater Sediments Using In-line Sediment Traps	Current
ECY004	Calculating Pollutant Loads for Stormwater Discharges	Current

12. Water Resources Program

SOP Number	SOP Title	Status
	Site Documentation for Wells included in Regional Well Circuits	Current
	Total Well Depth Measurement Using a Weighted Tape	Current
	Establishing a Measuring Point (MP)	Current
	Disinfection of Well Monitoring Equipment	Current
	Water-Level Measurements Using an Electric Sounding Tape	Current
	Depth-to-Water Measurement Using a Steel-Tape	Current
	Water-Level Measurement Using an Existing Air Line	Current
	Measuring Well Water Levels Using Submersible Pressure Transducers	Current
	Records Management	Current

Appendix D. Method Development activities by MEL

- Nanoparticles — silver, gold (2018).
- Flame retardants for consumer products (2018).
- Phthalates by GCMS for consumer products (2017).
- Consumer product extraction methods, microwave, dissolving, cryo-milling, cutting (2016, 2017, 2018).
- Formaldehyde in consumer products (2016).
- OPFRs by LC-MS/MS (water and soil) (2017–2018).
- PFAS on LC-MS/MS (soil and tissue) (2018).
- QTOF pesticide screening (2018).
- PESTMSQ3 on GC-MS/MS soil (2015, 2018).
- QuEChERS for PFAS tissue with Agilent EMR cleanup (2018).
- QuEChERS for PESTMSQ3 tissue (2015, 2018).
- Chlorinated flame retardants by GC-MS/MS (2017).
- New analytes for WSDA for PESTMS and CARBS (2015,2016,2017,2018).
- Herbicides by LC-MS/MS (2017).
- DOT cleanup and analysis (2015).
- PCB water by SPE (2016, 2018).
- TPH-Dx by SPE (to minimize contamination) (2017, 2018).
- GPC Cleanup for tissue and sediment (2018).
- Pyrethroids in sediment and water by NCI GCMS-ion trap (2015, 2016).

Appendix E. NEP Grantees that have used Ecology's QAPP Format

- City of Bainbridge Island
- City of Bellingham
- City of Duvall
- City of Edmonds
- City of Kirkland
- City of Mukilteo
- City of Olympia
- City of Redmond
- City of Tacoma (with Robinson Noble)
- Clallam County
- Coastal Geological Services, Inc.
- Coastal Watershed Institute
- Friends of the San Juans
- Herrera Environmental Consultants
- Hood Canal Coordinating Council
- Hood Canal Salmon Enhancement Group
- Island County Public Health
- Jefferson County
- King County Department of Natural Resources and Parks
- Kitsap County Public Health
- Long Live the Kings
- Mason County Public Health
- Nisqually River Foundation
- Nisqually Tribe / Land Trust
- Nooksack Tribe
- Northwest Straits Foundation & Natural Resources Consultants, Inc.
- (Adaptation International for) North Olympic Peninsula Resource Conservation
- North Olympic Peninsula Resource Conservation Development Council
- Pacific Northwest National Laboratory
- Pacific Shellfish Institute
- Pierce County Surface Water Management
- Port gamble S'Klallam Tribe
- Puget Sound Partnership
- Puget Sound Clean Air Authority
- Puget Sound Institute
- Puget Sound Institute
- San Juan County Public Health / Marine Resources Committee (MRC)
- Seattle Audubon Society
- Seattle Public Utilities
- Skagit County Public Health/Public Works
- Skagit River System Cooperative (with UW & NOAA)
- Snohomish County Public Works
- Snohomish County Conservation District
- Snoqualmie Tribe
- South Puget Sound Salmon Enhancement Group
- Stillaguamish Tribe
- Streamkeepers (Clallam County)
- Tacoma-Pierce County Health Department
- The Nature Conservancy
- Thurston County Public Environmental Health and Social Services

- Tulalip Tribes Natural and Cultural Resources Department
- University of Washington Applied Physics Laboratory
- University of Washington — Puget Sound Institute
- University of Washington — Tacoma
- University of Washington & NOAA
- Washington Department of Agriculture
- Washington Department of Ecology
- Washington Department of Fish and Wildlife (with NOAA & PNNL)
- Washington Department of Health
- Washington Department of Natural Resources
- Washington Environmental Council
- Washington Sea Grant
- Washington State University Extension
- Whatcom County
- Whatcom County Conservation District
- Whatcom County PUD #1
- Whidbey Island CD
- Wild Fish Conservancy
- Zero Waste Washington

Appendix F. Ecology Management Response to Quality Report to Management Issues

Topic	Page #	Comment	Opportunities for Resolution
Field sampling and data generation competency for Ecology staff and grant/loan recipients.	12	Capacity is a challenge for training and coordination. We need to focus on this in current fiscal year and next biennium.	Explore securing Americorps Individual Placement with appropriate qualifications for 1–2 years? Otherwise will need to consider using vendor if there continues to be very little EPA capacity to provide training. Consider using QA Coordinator team members on rotating basis to help with coordination?
QAPP guideline revisions and approval process for completed QAPPs.	12	Need to update guidance. Review and approval processes needs to be mapped out to clarity and improve efficiency. This will help ensure QAPPs are completed before activities begin.	
Independence of QA Officer — concern noted that position imbedded in an environmental program.	6	I do not support moving the QA Officer position into Program A in the budget or changing reporting relationship. I do not believe a conflict of interest exists or that there has been pressure applied to QA Officer to alter his professional opinion.	I have instituted regular meetings, one on one with QA Officer, so issues can be raised as they arise and to increase my involvement in QA.