Quality Assurance Project Plan

Ambient Water Quality Monitoring Network

May 2016

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water

State of Oregon
Department of Environmental Quality

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1. Project Management

1.1. Approval Sheet

Prepared By: _____ Date: _____

Mike Mulvey, Laboratory Project Manager

Reviewed By _____ Date: _____

Scott Hoatson, Quality Assurance Officer

Approved By: _____ Date: _____

Aaron Borisenko, Water Quality Monitoring Section Manager

Signed Copy on File at DEQ

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1.3. Distribution List

The following DEQ personnel will be emailed regarding all aspects of this QAPP/SAP. Final reports from the third party laboratories will be faxed/emailed and mailed to the Project Manager (PM), Laboratory Project Manager (LPM). Final reports from the DEQ laboratory may also be faxed/emailed and mailed to thePM, and LPM and data coordinator.

This QAPP will be posted on Q-Net (DEQ's internal website) at http://deq05/lab/qms/documents.asp. As prescribed by the laboratory's document control procedures, the official signed document will be filed at the DEQ laboratory. This project is expected to continue through multiple seasons, thus revisions should be anticipated. The PM may make revisions to this plan, which must be approved by the signatories on the approval page. The DEQ is not responsible for the control of reprinted copies from web sites or photo copies of the original plan. It is the responsibility of the reader to ensure that they are using the most current QAPP. The QAO will replace posted network files as the plan is revised.

Table 1 – Distribution List

Name	Phone	Email
Greg Coffeen	503-693-5725	Coffeen.Greg@deq.state.or.us
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Chris Redman	503-693-5706	Redman.Chris@deq.state.or.us
Brian Boling	503-693-5745	Boling.Brian@deq.state.or.us

To track the time and expenses spent on the Ambient Water Quality Monitoring Network DEQ personnel must use one of two Q-Time numbers. For sites paid for under an interagency agreement with the Oregon Department of Agriculture (ODA) use **44363**. For all other sites use **26269**. For time and expenses spent on the project as a whole use approximately 12% 44363 and 88% 26269. Q-time is DEQ's funds tracking system..

1.4. Acronyms

CCV Continuing Calibration Verification
CFR Code of Federal Regulations
DEQ Oregon Department of Environmental Quality (also ODEQ)
DQL Data Quality Level

EPA Environmental Protection Agency
HUC Hydrologic Unit Code
LCS Laboratory Control Sample
LIMS Laboratory Information Management System (Also called ELEMENTTM developed by Promium)
LEAP Laboratory and Environmental Assessment Program
LOD Limit of Detection
LOQ Limit of Quantitation
LPM Laboratory Project Manager
MB Method Blank
MOM Mode of Operations Manual
NELAP National Environmental Laboratory Accreditation Program
NIST National Institute of Standards and Technology
ORELAP Oregon Environmental Laboratory Accreditation Program
PM Project Manager
QA Quality Assurance
QAO Quality Assurance Officer
QC Quality Control
QAPP Quality Assurance Project Plan
QC Quality Control
QMP Quality Management Plan
SAP Sampling and Analysis Plan
SOP Standard Operating Procedure
USGS United States Geological Survey
WQM Water Quality Monitoring

1.5. Definitions

Sampling Event: A group of samples collected and/or shipped under a single chain of custody; by an individual or individual sampling team (usually a single day's sampling activity). After the sampling event is logged into Element, it is referred to as a Work Order.

Survey: The grouping of all the samples collected for a project during specific time period. The specific grouping and time periods must be defined in the QAPP or SAP. (Example: spring sampling for all of the samples in a specific basin). The QAPP/SAP completeness goal is based on a review of the data within a survey.

Survey Batch: The survey batch is a subset of the survey and is used to reflect how the samples are grouped relative to project Field QC samples. The survey batch defines what samples are associated with specific QC samples. (Example: Samples taken for a one week period by a specific sampling team may only have 1 Duplicate or one blank. All of the samples associated with the Duplicate and Blank are in the sample survey batch. The Survey Batch for each project must be defined in the QAPP or SAP.

1.6. Project/Task Organization

The Laboratory and Environmental Assessment Division's (LEAD) role covers monitoring network design, sample collection, analysis, reporting, data storage, and data verification in DEQ's data repository database. The LEAD is also responsible for maintaining data records, analysis of data, transferring data

to EPA databases, and for the development of Quality Assurance Project Plans (QAPPs) and Sampling and Analysis Plans (SAPs).

The project team organization provides the framework for conducting the sample collection tasks to meet study objectives. The organizational structure and function also facilitate project performance and adherence to Quality Control (QC) procedures and Quality Assurance (QA) requirements. Key roles are filled by those persons responsible for ensuring program planning, sample collection, data generation, data verification, as well as the persons responsible for validating data for usability with final products and deliverables.

The **LEAD Administrator** and **LEAD Managers** supervise staff and manage program workloads and budgets. These managers are ultimately responsible for ensuring that the project planning, sample collection, sample processing, data management, and data reporting are conducted in accordance to the approved project work plan, QAPP, and other materials developed to support the project.

The **Quality Assurance Officer** will be responsible for reviewing and approving all Quality Assurance Project Plans (QAPPs).

The **DEQ Laboratory Project Manager (LPM)** is responsible for overseeing development and implementation of the project and communication of programmatic accomplishments and findings with internal and external stakeholders. The LPM is also responsible for ensuring that project monitoring strategies are current and reflect program priorities.

The LPM will ensure that QA/QC protocols are maintained throughout the sample collection and preparation processes; review all field records for accuracy, and ensure that any problems encountered outside normal operating conditions are documented and addressed; and verify that all other field QA/QC procedures, which are identified in this QAPP, are followed.

The LPM also facilitates communication among staff involved with the project (the sample custodian, analytical staff, and field staff). The LPM will review all project data for accuracy and completeness. This project-level review will evaluate data quality after the laboratory has performed their section reviews and before the approval of work orders.

A **Technical Services Section staff** member will verify samples were logged into LIMS accurately.

The **Sample Custodian** will ensure project and QC samples are logged into LIMS appropriately.

Table 2 – Project/Task Responsibilities

Name	Project Title/Responsibility
Greg Coffeen	DEQ Laboratory Project Manager
Aaron Borisenko	DEQ Water Quality Monitoring Section Manager
Zach Mandera	DEQ Inorganic Analysis Lab Manager
Sara Krepps	DEQ Organic Analysis Lab Manager
Brian Boling	DEQ Laboratory and Environmental Assessment Program Manager
Chris Redman	Quality Assurance Officer
Melanie Miller	Sample Custodian

1.7. Problem Definition/Background

The state of Oregon boasts an abundance and diversity of water resources. Nine major estuaries are situated along the coast of the Pacific Ocean; 6000 lakes and reservoirs are scattered throughout the state, including many pure lakes in the high Cascade Mountain region. A network of over 110,000 miles of rivers and streams cross and border the state, with groundwater aquifers lying beneath the surface.

Oregon ranks tenth in the nation in total area. It is bordered by the Pacific Ocean to the west, by the lower reach of the Columbia River to the north, and by the Snake River to the east. A large percentage of the state's population resides in the metropolitan Portland area and the Willamette Valley. Population growth continues to bring economic and environmental change to the state. A shift from natural resource-based jobs to high-technology jobs presents different environmental quality problems. At the same time, population growth, particularly in urban areas, demands expanding capacity (and increasing funding) for pollution control. As recreational use of the state's rivers and lakes increases, there is a greater need for protecting water quality.

The Oregon Department of Environmental Quality (ODEQ) is that state agency responsible for protecting water quality throughout Oregon. The Water Quality Division within DEQ administers the Water Quality Program. Monitoring and evaluation are essential components of Oregon's water pollution control programs. The basis for documenting water quality conditions is provided by routine or ambient sampling at established river and estuary stations.

Since the Water Year (WY) 1976, the ODEQ has maintained a relatively consistent fixed-station network to monitor major rivers of concern. A statewide network of 160 sites is sampled on a regular schedule to provide conventional pollutant data that is used to determine:

- Baseline water quality;
- General problem areas needing further investigation;
- Management effectiveness;
- Water quality limited stream segments and segments where TMDLs need to be established; and
- Long-term trending

Some of these sites have been monitored since the late 1940's. The network sites were selected to represent all major rivers in the state and provide statewide geographical representation. The locations of those sites reflect the integrated water quality impacts from point and non-point source activities, as well as the natural geological, hydrological, and biological impacts on water quality for the watershed they represent. Large river basins have multiple sites, the locations of which may be based upon tributaries, land use change, topographical changes, eco-regions, point sources, and non-point sources. Sampling frequency is based upon resources, priorities, statistical needs for trending, and determining central tendency and data distribution characteristics.

Approximately 3,500 miles of the state's total river miles are routinely monitored as part of the ODEQ ambient river monitoring program. The monitored rivers and streams receive approximately 90 percent of the point source loading for the state.

1.8. Quality Objectives and Criteria

The ODEQ Laboratory document control procedures ensure the most recently approved Quality Systems documents are available for implementation. These documents are available through Q-Net at (http://deq05/Lab/qms/documents.asp). Specific Quality Systems documents cited in this QAPP contain a hyperlink to the controlled document for easy reference.

Samples collected for laboratory analysis will be analyzed following standard DEQ protocol as described in the Laboratory Quality Manual (DEQ91-LAB-0006-LQM) and the Laboratory's analytical SOPs. Procedures for collecting Water Quality samples and conducting field analyses are described in the Watershed Assessment Section Mode of Operations Manual (MOMs: DEQ03-LAB-0036-SOP).

Environmental data is assumed to be acceptable for use when associated QC data is within established control limits. It is therefore important to define appropriate QC data and how to interpret the QC data as is applies to the reported environmental data.

To establish relationships between environmental data and QC data, EPA's Guidance for the Data Quality Objectives Process (QA/G-4, EPA 2006) was used. As the title implies this document is intended to provide guidance for establishing a plan for data collection efforts and for developing an appropriate data collection design to support decision making, i.e. develop acceptance or performance criteria for the quality of the data collected and for the quality of the decision.

The QA/G-4 guidance document defines two sources of error Statistical Sampling Error (Field Variability) and Measurement Error (Measurement Variability), which contribute partially to the total error.

Sampling (field) error – This error is influenced by the inherent variability of the contaminant over space and time, the sample collection design, and the number of samples. It is usually impractical to measure the entire space, and limited sampling may miss some features of the natural variation of the measurement. Sampling design error occurs when the data collection design does not capture the complete variability within the environment, to the extent appropriate for making conclusions. Sampling design error can lead to random error (i.e., variability or imprecision) and systematic error (bias) in estimates of contaminant concentrations.

Measurement error – This error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, data reduction, transmission, and storage.

Turnaround time: The expected turnaround time for the final laboratory reports is 45 days from the time arrive in the laboratory. Achieving or not achieving the turnaround time does not affect data quality.

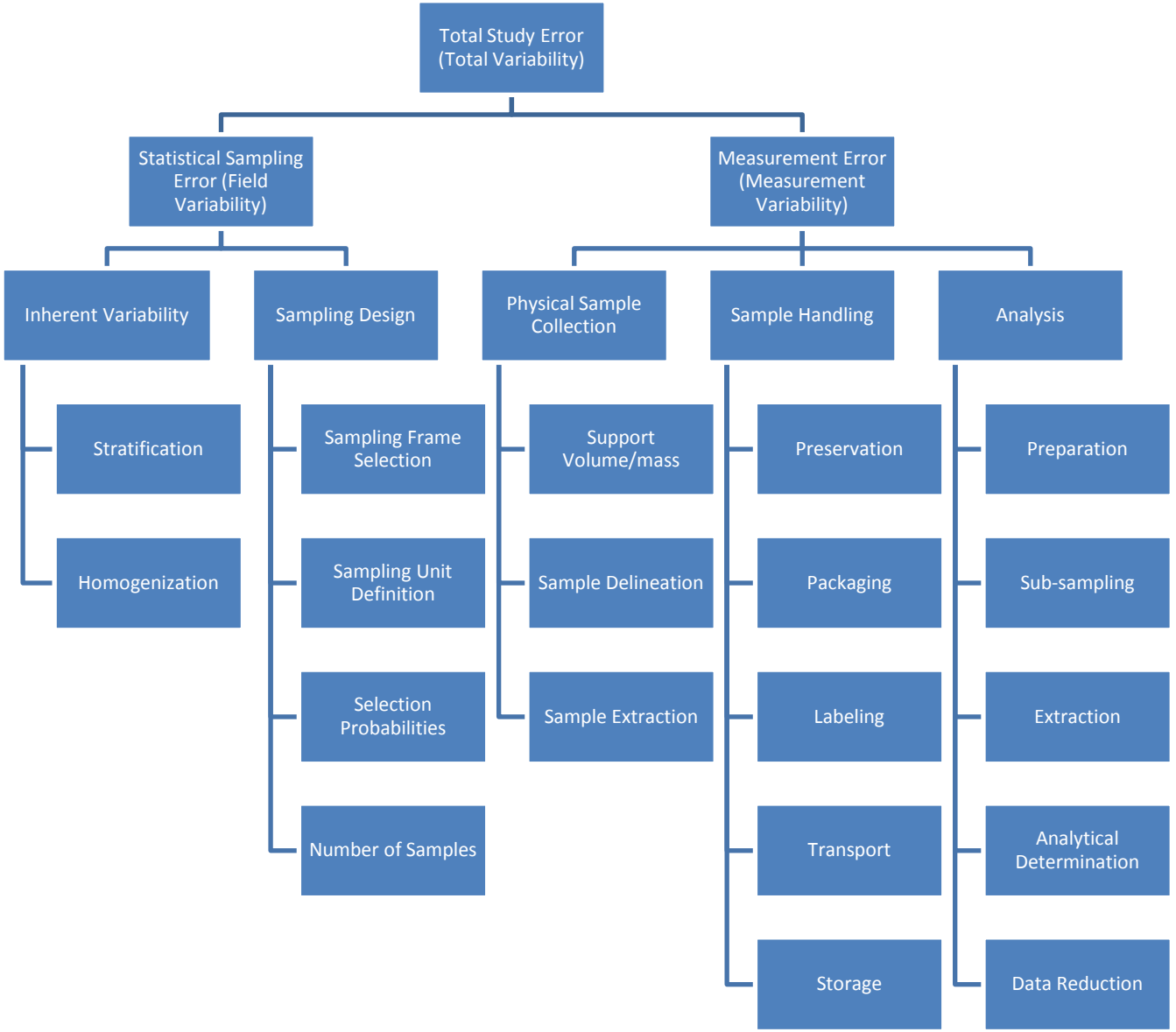

Figure 1 – Sources of Error

Figure 1 illustrates where errors can occur in procedural steps used for generating environmental data. During many of these procedural steps, QC measurements can be taken or QC samples can be introduced into the process thereby making it possible to estimate the error attributable to a specific protocol. With each procedural step that a QC element can be implemented, environmental data will be batched with the QC result in which the samples or data were processed. Section 2.5 will further define the QC batches to be used for this project. With the knowledge of an unacceptable error in the QC measurement, environmental samples within the QC batch are either reprocessed after improvements are made to minimize the observed error, or the environmental data will be flagged as not meeting the quality control standard. Often it is physically impossible to reprocess samples or it is not cost effective, in which case data must be flagged in a manner that ensures the data user is aware of the data quality anomaly.

Specific QA Objectives for this project are:

Collect a sufficient number of samples, sample duplicates, and field blanks to evaluate the sampling and measurement error.

Analyze a sufficient number of QC Standards, blanks and duplicate samples in the Laboratory environment to effectively evaluate results against numerical QA goals established for precision and accuracy.

Implement sampling techniques in such a manner that the analytical results are representative of the media and conditions being sampled.

Data quality shall be evaluated through the use of the traditional Data Quality Indicators:

- Precision
- Accuracy/Bias
- Sensitivity
- Representativeness
- Comparability
- Completeness

Table 6 in section 2.5 lists precision, accuracy, and sensitivity control limits for each parameter of concern.

1.8.1 Precision

Precision shall be estimated by measuring the variability of duplicate measurements. The best estimate of precision for the overall monitoring program is the comparison of duplicate samples collected in the field. The variability in the results obtained from field duplicate samples is the sum of the sampling and analytical variability (measurement uncertainty). In general, the control limit for duplicate samples collected in the field are +/-30% relative percent Difference (RPD)[1] for samples >5 times the Limit of Quantitation (LOQ) or +/- 2x the LOQ for the difference between replicates when the concentrations are <5 times the LOQ.

[1] Relative Percent Difference (RPD) is the difference of two duplicate samples divided by the mean of the duplicate samples times 100%. $RPD = \frac{A-B}{(A+B)/2} * 100\%$. A and B are measurements from duplicate samples collected in the field at the same location and at the same time.

1.8.2 Accuracy/Bias

Accuracy is a measure of the error between reported test results and the true sample concentration. It shall be estimated by measuring the bias of Measurement Error, even though bias is due to both systematic error in sampling and measurement variability.

Systematic error attributable to sampling design shall be minimized and be considered acceptable by following the procedures in described in section 0.

All instruments shall be calibrated using appropriate reference materials. The accuracy of these materials is to be documented and maintained by the laboratory. The instrument's response to the reference material (initial calibration) shall also be documented and fall within method control limits. Immediately following the initial calibration a second source standard will be used to verify the accuracy of the calibration reference material.

The Laboratory Control Samples (LCS) prepared with each batch of samples will be used to estimate accuracy and where applicable matrix spikes will be used in conjunction with the LCS.

1.8.3 Sensitivity

Table 6 lists the parameters of interest for this project and the target reporting level. A value less than the laboratory's LOQ will be reported as an estimate.

Blanks must be less than the Limit of Quantitation for each analyte listed in Table 6. Laboratory Method Blanks (MB) will be prepared along with each LCS. The MB will be used to assess the sensitivity of the method. If corrective action measures fail to resolve MB errors, results batched with the MB will be flagged with the appropriate data qualifier.

1.8.4 Significant Figures

Most results are reported to 3 significant figures. All results will be rounded according to standard rounding rules and then compared to the LOQ.

1.8.5 Representativeness

Representativeness is a qualitative term that should be evaluated to determine whether in situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.[1] The intent of this project is to quantify chemical, biological, and physical parameters in the ambient environment.

Representativeness is controlled by using well defined sampling and sample handling SOPs. Sampling procedures are designed so that results are representative of the matrix being sampled. Sample handling protocols for storage, preservation and transportation have been developed to preserve the representativeness of the collected samples. Proper documentation will establish that protocols have been followed and sample identification and sample integrity assured. If it is determined that sample integrity has been compromised data will be flagged with the appropriate data qualifier.

Samples that are not representative of the population often occur in judgmental sampling because not all the units of the population have equal or known selection probabilities[2]. The rational for selecting sampling stations is described in section 0 below.

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[1] USEPA 1998. EPA Guidance for quality assureance project plans EPA QA/G-5, pp 76.

[2] ibid, pp 94.

The location of the sample will be referenced to latitude and longitude using a GPS. Samples will be collected at or near the center of the stream channel where the water is well mixed and representative of the ambient conditions. The date and time range measurements are made and physical samples collected will be recorded with every sample. All efforts will be made to confirm the accuracy of this sample meta-data.

Since special or unusual sample conditions might affect the accuracy of an analysis, it is helpful to have information about the sample matrix. Results of such matrix tests may give additional insight into the representativeness of the analyses. Tests describing the sample matrix may be requested on a site-specific basis. When appropriate, other QA tools such as ion balance reports, solid balances, conductivity-dissolved solid comparisons, etc., will be used to establish the representativeness of the data.

Quality analytical measurements with poor field duplicate precision may point to sampling problems or heterogeneous samples and thus not representative of ambient conditions. To ensure the representative data quality indicator is correct, field duplicates must be collected within 15 minutes and 15 meters of each other, where the sample matrix is assumed to be homogeneous. Evaluation of field duplicate, lab duplicate, and accuracy data will provide information if there is error in the hypothesis that the sample is homogeneous. If field duplicate data exceeds precision limits but lab duplicate and accuracy data is acceptable, the sampling design may be in error and the data may not represent the environmental conditions for which it was collected. If field duplicate data indicates Representativeness is acceptable, data users may assume other project data meet Representativeness objectives.

The LPM will qualify or narrate environmental results for samples obtained outside the representative area of a station or create a new station. The DQL will remain unchanged if the Lat/Long of the actual sample location is documented.

If station data is not indicative of the normal ambient conditions and the variances are attributable to anomalous environmental conditions, the project station data will qualified and assigned a DQL of “F”.

1.8.6 Comparability

To ensure data will be comparable to similar environmental data, the DEQ will use documented procedures for sampling, sample handling, and sample analysis, which are written to comply with nationally accepted methods. Coordination with other agencies is emphasized to ensure that data are comparable. The DEQ laboratory will follow the analytical methods cited in Table 6, which are promulgated methods in 40 CFR Part 136 and the sampling procedures described in the ODEQ Laboratory MOMs Manual.

1.8.7 Completeness

It is expected that samples will be collected from all sites described in a Sampling and Analysis Plan (SAP) unless seasonal-related events or safety issues prevent sampling. On an analyte basis, more than 95% of the data obtained from this project must have a DQL of A or B. The LPM may authorize re-sampling to obtain additional site data with DQL of A or B if necessary.

1.9. Special Training and Certification

Contractual agreements require third party laboratories to be NELAP/ORELAP accredited where available. Refer to the ORELAP web page (http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx) to review a laboratory’s accreditation status.

1.10. Documentation and Records

Contractual agreements may require laboratories to become ORELAP accredited. Refer to the TNI laboratory database web page (http://lams.nelac-institute.org/search) to review the laboratory's accreditation status.

1.10.1 Analytical Reports

Third party laboratories will send their Analytical Report along with their subcontracted data to the DEQ PM and LPM within 45 days of the completion of each work order. These data, including all QA/QC data results, will be delivered both electronically and in paper form.

The data coordinator will enter third party data by hand or download it into the DEQ's LIMS database, where the LPM will review and approve data for further processing.

Electronic versions of the final LEAP laboratory analytical reports will be e-mailed to the distribution List specified in Section A3 in a Portable Document Format (PDF). An original hard copy of the final analytical report with the supporting QC documentation and field forms will be kept on file at the DEQ Laboratory. After the final analytical report has been released, the analytical results will be transferred to a web accessible data repository which is available to the public.

Analytical reports will contain sufficient information to unambiguously link sample collection information to the group of analytical parameters.

1.10.2 Sample Receipt and Log-in Procedures

Separate field data sheets and Chain Of Custody (COC) forms will be maintained for each work order. A template COC/Field Data form can be found on Q-Net with document ID DEQ06-LAB-0054-FORM as well as Technical Service's "Sample Receiving and Control" procedure (DEQ06-LAB-0054-SOP).

The DEQ laboratory must receive the COC with sufficient recorded information to log samples into Element™ and to identify the accompanying containers. The LPM is responsible for developing Element™ "Client" and "Project" data records to accommodate sample receipt login. The following information will be required for Station ID creation: Site name, latitude, longitude, river mile, 3rd and 4th field HUC, county, and DEQ basin.

Please note that the third party laboratories will in general follow similar procedures below. However, specific documentation and custody procedures will be as per their protocol.

The laboratory receiving the samples will verify the information contained on the custody form and check to make certain that samples meet appropriate handling and preservation requirements by:

- Matching actual sample container #'s with those listed on the custody form;
- Checking that appropriate containers were used for the analytes requested;
- Testing pH to determine whether samples requiring acid or base preservation were preserved correctly;
- Consulting technical personnel when field observations raise concern to ensure tests requested are appropriate;
- Consulting this QA Project Plan for ensuring that all tests requested are assigned.

Samples improperly documented, preserved, or exceeding holding time are either rejected for analysis or analyzed and the result reported with a qualifier with a DQL of "B". If rejecting the sample for analysis a "V" (Void) qualifier is applied with a DQL of "D". The sampler should be notified and re-sampling is generally recommended.

The contractor will use laboratory approved sampling forms to be used for tracking the samples and relinquishing sample custody. The DEQ sample coordinator will receive a copy of the custody forms and enter the work order into the DEQ's Laboratory Information Management System (LIMS).

The DEQ LIMS maintains the history to changes to data in LIMS from log-in through sample release and archival. All biographical information contained on the custody form is entered into LIMS at the time of log-in. Each set of containers collected at a station constitutes a "sample," and each "sample" is linked to the work order batch. The DEQ LIMS sample ID numbers are unique. The ID number consists of the work order number concatenated with the sample number. The sample coordinator assigns the appropriate "Client/Project" combination in LIMS which in turn creates analysis records for each sample and test assigned.

The contract laboratories must maintain an unequivocal link between the custody form, their LIMS database, and analytical reports.

Raw analytical data records must be maintained, which will include the following information, in ink:

- Date of analysis
- Analyst
- Identification of blanks, standards, and controls
- LIMS ID numbers, sample number, treatment such as dilutions, analyte additions, or special calculations and associated information
- Unusual observations

All instrument readings and final results (including units) may be maintained as electronic data.

1.10.3 Field Documentation

The sampling team uses the chain of custody (COC)/field data sheets to document the record of significant events, observations, and measurements during field investigations. This record may include water level data, field measurements, personnel, significant weather observations, and physical conditions should they exist such as plankton abundance and conditions of riparian zones. All entries in the chain of custody/field data sheets should be signed and dated. The COC/field data sheets will accompany the samples collected and the sample coordinator will create a work order file where field and analytical reports will be retained.

2. Data Generation and Acquisition

2.1. Sampling Process Design

Sites were selected primarily as integrator sites; they reflect the integrated water quality affects from point and non-point source activities as well as the natural geological, hydrological and biological impacts on water quality for the watershed that they represent. Larger river basins have multiple sites, which may be based upon tributaries, land use changes, topographical changes, ecoregions, point sources, and non-point sources. Sampling frequency is based upon resources, priorities; and statistical needs for trending, determining central tendency, and data distribution characteristics. Survey batch (Section 2.5.4) sampling locations are documented and maintained in the individual project note books. Monthly WQM schedules are available on SharePoint under LEAD\WQM, which list the Element™ Projects to be collected during

the month. Currently there are nine Projects in Element™ (refer to Figure 2). Table 3 lists current sample stations and Figure 3 provides a map of their locations.

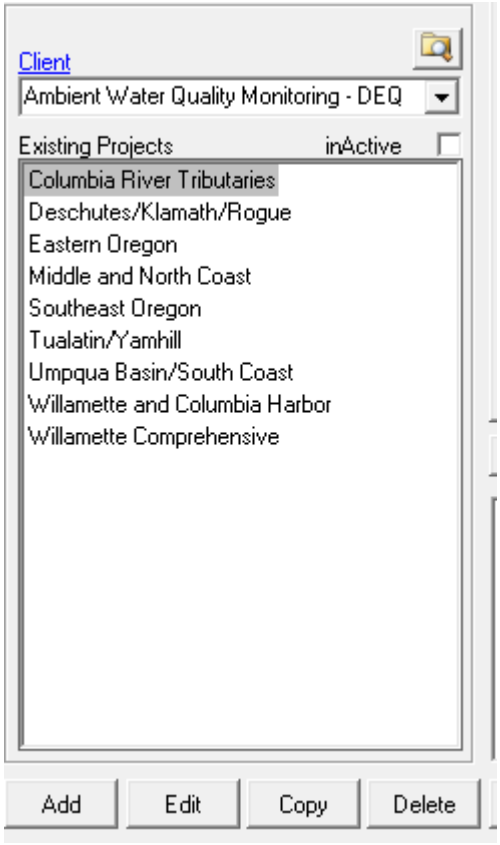

Figure 2 – Network Projects

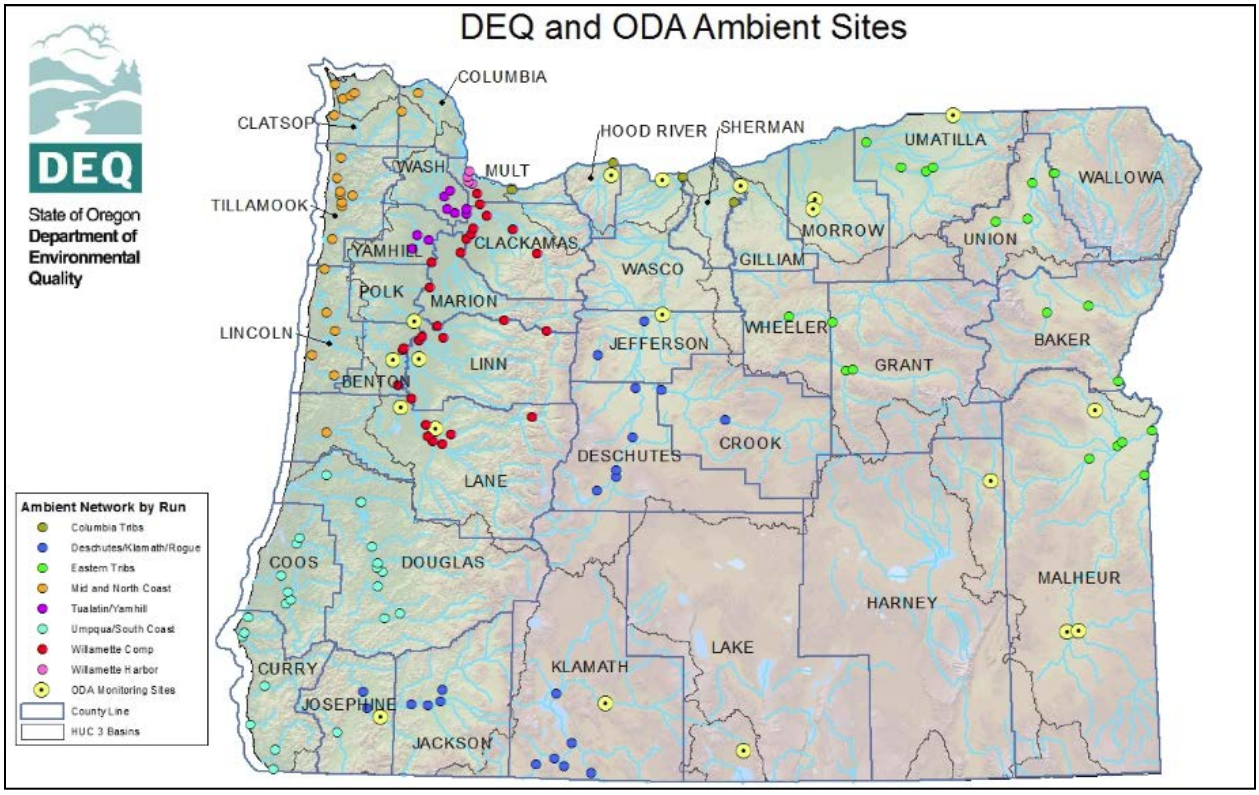

Figure 3 – Map of Ambient Network

Where site locations safely allow, samples should be collected from the center of the main channel, at a depth of one meter or half the total depth, whichever is greater. This ensures a sample representative of environmental conditions.

Table 3 – Sample Locations by Basin. ODA sites are in bold font.

Site	Station Number	Latitude	Longitude	River Mile	Samples per Year	Site Type
Columbia River Mainstem						
Columbia River at Portland Marker 47 (u/s Willamette)	10616	45.51331	-122.66989	102.5	6X	ODEQ
Deschutes River Basin						
Crooked River at Conant Basin Rd.	11477	44.17255	-120.54114	105.0	6X	ODEQ
Crooked River at Lone Pine Rd.	11405	45.47686	-120.46864	29.9	6X	ODEQ
Deschutes River at Deschutes River Pk. (Mouth)	10411	45.63022	-120.91016	1.0	6X	ODEQ
Deschutes River at Harper Bridge (Sunriver)	10686	45.53850	-122.37544	191.7	6X	ODEQ
Deschutes River at Lower Bridge	10508	44.36005	-121.29336	133.4	6X	ODEQ
Deschutes River at Mirror Pond (Bend)	10511	44.06008	-121.32044	164.9	6X	ODEQ
Deschutes River at Pringle Falls	10688	43.86400	-121.45119	216.0	6X	ODEQ
Deschutes River at Warm Springs	10506	44.76117	-121.22781	96.8	6X	ODEQ
Little Deschutes River at HWY 42	10696	44.55650	-121.61953	5.5	6X	ODEQ
Metolius River at Bridge 99 (Camp Sherman)	10690	43.74425	-121.60539	30.3	6X	ODEQ
Trout Creek down streams of Mud Springs Creek	**36776**	**44.8012**	**-121.0658**		**6X**	**ODA**

Site	Station Number	Latitude	Longitude	River Mile	Samples per Year	Site Type
Goose and Summer Lake Basin						
Chewaucan River 2.4 miles US of Paisley	33930	42.6779	-120.5838	36.6	6X	ODEQ
Deep Creek west of Adel	12267	42.17445	-119.92667	8.0	6X	ODEQ
Honey Creek at Plush	10741	42.84056	-117.62172	0.2	6X	ODEQ
Thomas Creek at Stock Drive Rd	**36778**	**42.1786**	**-120.3843**		**6X**	ODEQ
Twentymile Creek at HWY 140	12266	42.17611	-119.84194	3.5	6X	ODEQ
Grande Ronde River Basin						
Grande Ronde River at Hilgard St. Pk.	10720	45.56689	-117.90928	166.8	6X	ODEQ
Grande Ronde River at HWY 82 (Elgin)	10719	43.82864	-121.44278	99.0	6X	ODEQ
Grande Ronde River at Peach Lane (Island City)	11521	45.34972	-117.96261	151.1	6X	ODEQ
Minam River at Minam	11457	45.61956	-117.72994	0.1	6X	ODEQ
Wallowa River at Minam	10410	45.62131	-117.71964	10.0	6X	ODEQ
Hood River Basin						
Hood River at Footbridge d/s of I-84	12012	45.71072	-121.50672	0.9	6X	ODEQ
Neal Creek at Fir Mountain Rd	**33603**	**45.6387**	**-121.5134**		**6x**	**ODA**
Fifteenmile Creek at Petersburg, OR	**28333**	**45.6099**	**-121.0785**		**6x**	**ODA**
John Day River Basin						
Rock Creek near mouth	**36787**	**45.5764**	**-120.4015**		**6x**	**ODA**
John Day River at HWY 206	11386	45.44717	-122.64225	39.5	6X	ODEQ
John Day River at Service Creek	11478	44.79261	-120.00183	157.4	6X	ODEQ
John Day River u/s Dayville	11479	44.46600	-119.47144	215.4	6X	ODEQ
North Fork John Day River at Kimberly	11017	42.94386	-123.33575	0.2	6X	ODEQ
South Fork John Day River at Dayville	11020	44.75600	-119.63770	0.2	6X	ODEQ
Klamath River Basin						
Klamath River at Keno	10765	42.08692	-122.05991	234.2	6X	ODEQ
Klamath River d/s Big Bend Powerhouse	10764	42.07992	-121.84072	219.9	6X	ODEQ
Klamath Strait at USBR Pump Station F	10763	42.04042	-121.62267	2.0	6X	ODEQ
Link River at Mouth (Entrance to Lake Ewauna)	10768	42.12806	-121.92778	0.1	6X	ODEQ
Lost River at HWY 39 (u/s Merrill)	10759	42.19278	-120.38831	12.1	6X	ODEQ
Williamson River at Williamson River Store	10770	42.21878	-121.78836	4.6	6X	ODEQ
Sprague River at Sprague River Rd	**21535**	**42.4628**	**-121.5058**		**6x**	ODEQ
Malheur Lake Basin						
Donner und Blitzen River at Page Springs Camp	12265	42.80108	-118.86658	45.0	6X	ODEQ
Silvies River at West Loop Road	33929	43.6341	-119.0771	7.4	6X	ODEQ
South Fork Blitzen River at Blitzen Crossing	13014	42.63889	-118.76222	3.6	6X	ODEQ
Trout Creek u/s Little Trout Creek	12269	42.18717	-118.36933	24.0	6X	ODEQ
Whitehorse Creek at Whitehorse Ranch Road	12264	42.33761	-118.23411	11.0	6X	ODEQ
Willow Creek north of Jamieson, OR	**33266**	**44.1880**	**-117.4368**		**6X**	**ODA**
Malheur River Basin						
Bully Creek at HWY 20 (Vale)	11043	44.46564	-119.53122	2.3	6X	ODEQ
Malheur River at HWY 201 (Mouth)	10407	44.05675	-116.97222	0.5	6X	ODEQ
Malheur River at Little Valley	11480	43.91033	-117.50758	49.0	6X	ODEQ
Malheur River at HWY 20 (Drewsey)	**11047**	**43.7854**	**-118.3317**		**6x**	**ODA**
Willow Creek at RR Xing east of Vale	10728	44.81833	-117.46750	4.3	6X	ODEQ
Mid Coast Basin						
Alsea River at Thissell Rd. (Mike Bauer Park)	11263	45.02342	-123.94497	17.7	6X	ODEQ

Site	Station Number	Latitude	Longitude	River Mile	Samples per Year	Site Type
North Beaver Creek at NW Beaver Valley Drive	33644	44.5030	-124.0216	4.8	6X	ODEQ
Salmon River at Old Scenic HWY 101 (Otis)	11241	45.38034	-122.58386	2.8	6X	ODEQ
Siletz River 5 miles d/s of Siletz	10391	44.76439	-123.91356	30.9	6X	ODEQ
Siuslaw River at Tide Wayside	10392	44.0685	-123.8428	25.5	6X	ODEQ
Yaquina River at Trapp Creek Rd. (Chitwood)	11476	44.65767	-123.83478	24.9	6X	ODEQ
North Coast Basin						
Clatskanie River at HWY 30 (Clatskanie)	11434	46.10203	-123.19759	4.7	6X	ODEQ
Kilchis River at Alderbrook Rd.	13417	45.49631	-123.84258	1.2	6X	ODEQ
Klaskanine River at Youngs River Loop Rd. (Olney)	11904	46.09117	-123.75111	1.3	6X	ODEQ
Lewis & Clark River at Logan Road	10817	46.14897	-123.92436	7.6	6X	ODEQ
Miami River at Moss Creek Rd.	13411	45.57516	-123.87231	1.7	6X	ODEQ
Necanicum River at Riverside Lake Camp (Seaside)	10521	44.34869	-121.08070	5.8	6X	ODEQ
Nehalem River at Foley Rd. (Roy Creek Campground)	11856	45.70036	-123.84245	7.8	6X	ODEQ
Nehalem River at HWY 202 Bridge in Birkenfeld	34019	45.9890	-123.3378	64.9	6X	ODEQ
Nestucca River at Cloverdale	10523	45.95242	-123.92389	1.7	6X	ODEQ
Skipanon River at HWY 101	10812	45.56380	-122.70908	4.9	6X	ODEQ
Tillamook River at Bewley Creek Rd.	13440	45.40861	-123.82472	6.8	6X	ODEQ
Trask River at HWY 101	13433	45.42944	-123.82389	4.2	6X	ODEQ
Wilson River at HWY 101	13421	45.47803	-123.84311	1.8	6X	ODEQ
Wilson River at HWY 6 (RM 8.5)	13424	45.47181	-123.73561	8.5	6X	ODEQ
Youngs River at Youngs River Loop Rd.	12187	46.06956	-123.78558	8.9	6X	ODEQ
Owyhee River Basin						
Jordan Creek u/s Lone Tree Cr.	12261	42.91139	-116.99528	53.0	6X	ODEQ
Jordan Creek at Arock Rd	**11050**	**42.9052**	**-117.5195**		**6X**	ODEQ
North Fork Owyhee River at Three Forks	12263	42.54395	-117.15639	1.0	6X	ODEQ
Owyhee River at HWY 201	10729	43.98806	-117.22916	2.9	6X	ODEQ
Owyhee River at Sand Springs	12258	43.00833	-117.73139	105.0	6X	ODEQ
Owyhee River u/s Hot Springs at Three Forks	12262	42.52814	-117.18344	163.5	6X	ODEQ
Owyhee R. @ Rome (Hwy. 95)	10730	43.7838	-117.0544	123.9	6X	ODEQ
Crooked Creek at Kiger Rd	**36783**	**42.8604**	**-117.7331**		**6X**	**ODA**
Powder River Basin						
Burnt River d/s Huntington	11494	44.36055	-117.24306	1.1	6X	ODEQ
Powder River at Campbell St. (Baker City)	11490	44.78194	-117.82667	119.3	6X	ODEQ
Powder River at HWY 86	10724	45.34208	-118.23556	32.1	6X	ODEQ
Rogue River Basin						
Applegate River at HWY 199	10428	42.39750	-123.45583	2.6	6X	ODEQ
Applegate River at Murphy, OR	**36805**	**42.3438**	**-123.3331**		**6X**	**ODA**
Bear Creek at Kirtland Rd.	11051	43.96730	-117.26886	0.9	6X	ODEQ
Illinois River d/s Kerby	11482	42.23983	-123.68955	48.4	6X	ODEQ
Little Butte Creek at Agate Rd. (White City)	10602	43.17378	-124.19253	1.4	6X	ODEQ
Rogue River at HWY 234 (Dodge Park)	10423	42.52533	-122.84158	138.4	6X	ODEQ
Rogue River at Lobster Creek Bridge	10414	42.50367	-124.29217	11.0	6X	ODEQ
Rogue River at Robertson Bridge (Merlin)	10418	42.49508	-123.48600	86.6	6X	ODEQ
Rogue River at Rock Point Bridge (N. of Gold Hill)	10421	42.43269	-123.08939	117.3	6X	ODEQ
Sandy River Basin						
Sandy River at Troutdale Bridge	10674	44.09230	-122.95934	3.1	6X	ODEQ

Site	Station Number	Latitude	Longitude	River Mile	Samples per Year	Site Type
South Coast Basin						
Chetco River at USGS Gage (10 Miles u/s Brookings)	11483	42.12361	-124.18611	10.8	6X	ODEQ
Coquille River at Sturdivant Pk. Dock (Coquille)	10596	44.94611	-123.04153	24.5	6X	ODEQ
Elk River at HWY 101	11905	42.79472	-124.48725	3.4	6X	ODEQ
Floras Creek at HWY 101	12590	42.91628	-124.45169	4.1	6X	ODEQ
Middle Fork Coquille R at river mile 1.25 Hwy 42	33922	43.0329	-124.1001	1.25	6X	ODEQ
Millicoma River at Rooke-Higgins Boat Ramp	13570	43.40611	-124.05833	3.5	6X	ODEQ
North Fork Coquille River at HWY 42 (Myrtle Point)	10393	43.07858	-124.13667	0.2	6X	ODEQ
Pistol River at Pistol River Loop Rd.	11493	42.27222	-124.39555	1.2	6X	ODEQ
Sixes River at HWY 101	10533	45.20728	-123.88897	5.5	6X	ODEQ
Smith River 4.4 mi. DS of Smith River Falls	11491	43.7888	-123.8620	24.5	6X	ODEQ
South Fork Coos River at Anson Rogers Bridge	13574	43.37431	-124.08486	2.5	6X	ODEQ
South Fork Coquille River at Broadbent	11486	43.00861	-124.14944	10.0	6X	ODEQ
Winchuck River 1.3 Miles u/s HWY 101	10537	42.81697	-124.48097	2.5	6X	ODEQ
Umatilla River Basin						
McKay Creek at Kirk St. (Pendleton)	12005	45.65445	-118.82303	1.5	6X	ODEQ
Umatilla River at HWY 11 (Pendleton)	10406	45.67480	-118.75850	57.1	6X	ODEQ
Umatilla River at Westland Rd. (Hermiston)	11489	45.83569	-119.33195	8.7	6X	ODEQ
Umatilla River at Yoakum	10404	45.67744	-119.03539	37.2	6X	ODEQ
Pine Creek at Hudson Bay Substation Rd	**36786**	**45.9868**	**-118.5679**		**6x**	**ODA**
Rhea Creek at Bergevin Rd. or Morter Rd	**36785**	**45.4380**	**-119.7816**		**6x**	**ODA**
Willow Creek at Rhea Rd	**36784**	**45.4935**	**-119.7695**		**6x**	**ODA**
Umpqua River Basin						
Calapooya Creek at Umpqua	10996	45.16867	-123.20692	0.4	6X	ODEQ
Cow Creek at Mouth	10997	43.36666	-123.45944	0.3	6X	ODEQ
Elk Creek at Elkton	10441	43.63514	-123.56345	0.2	6X	ODEQ
North Umpqua River at Garden Valley Rd.	10451	43.27342	-123.41306	1.8	6X	ODEQ
South Umpqua River at Days Creek Cutoff Rd.	11484	42.97094	-123.21575	55.5	6X	ODEQ
South Umpqua River at HWY 42 (Winston)	10443	43.13389	-123.39794	21.2	6X	ODEQ
South Umpqua River at Melrose Rd.	10442	43.24178	-123.41106	5.1	6X	ODEQ
South Umpqua River at Stewart Park Rd. (Roseburg)	11522	43.21778	-123.36555	10.7	6X	ODEQ
Umpqua River at Elkton	10437	43.63186	-123.56583	48.4	6X	ODEQ
Willamette River Basin						
Amazon Creek at High Pass Rd	**36788**	**44.2152**	**-123.2503**		**6x**	**ODA**
Beaverton Creek at Cornelius Pass Rd (Orenco)	10480	45.52086	-122.89875	0.3	6X	ODEQ
Calapooia Creek at HWY 99E	**11182**	**44.5043**	**-123.1083**		**6x**	**ODA**
Calapooia River at Queens Rd. (Albany)	11180	44.34286	-123.29444	3.0	6X	ODEQ
Clackamas River at High Rocks	11233	45.61036	-122.75392	1.2	6X	ODEQ
Clackamas River at McIver Pk. (Upper Boat Ramp)	13070	45.29939	-122.36033	22.6	6X	ODEQ
Clackamas River at Memaloose Rd.	14008	45.16056	-122.15372	35.7	6X	ODEQ
Coast Fork Willamette River at Mt. Pisgah Pk.	11275	44.38269	-123.83100	3.0	6X	ODEQ
Columbia Slough at Landfill Rd.	11201	44.62008	-123.12786	2.6	6X	ODEQ
Fanno Creek at Bonita Rd. (Tigard)	10469	45.41506	-122.75475	2.3	6X	ODEQ
Johnson Creek at SE 17th Ave. (Portland)	11321	44.01003	-122.98511	0.2	6X	ODEQ
Long Tom River at Stow Pit Rd. (Monroe)	11140	42.42639	-122.95580	4.7	6X	ODEQ
Luckiamute River at Buena Vista Rd	**36875**	**44.7303**	**-123.1625**		**6x**	**ODA**

Site	Station Number	Latitude	Longitude	River Mile	Samples per Year	Site Type
Mary's River at HWY 99W (Corvallis)	10373	44.55664	-123.26364	0.2	6X	ODEQ
McKenzie River at Coburg Rd.	10376	44.11272	-123.04620	7.1	6X	ODEQ
McKenzie River at Hendricks Bridge	10662	45.15036	-122.79253	24.0	6X	ODEQ
McKenzie River at McKenzie Bridge	12552	44.17417	-122.16139	68.1	6X	ODEQ
Middle Fork Willamette River at Jasper Bridge	10386	43.99820	-122.90528	8.0	6X	ODEQ
Mohawk River at Hill Rd	**10663**	**44.0928**	**-122.9566**		**6x**	**ODA**
Molalla River at Knights Bridge Rd (Canby)	10637	45.64564	-122.73886	2.5	6X	ODEQ
Muddy Creek south of Corvallis at Airport Ave	**36790**	**44.4968**	**-123.3306**		**6x**	**ODA**
North Santiam River at Coopers Ridge Rd.	12559	44.69320	-122.04860	63.8	6X	ODEQ
North Santiam River at Gates School Rd.	12553	44.75278	-122.41167	39.0	6X	ODEQ
North Santiam River at Greens Bridge	10792	42.51461	-121.91619	2.9	6X	ODEQ
North Yamhill River at Poverty Bend Rd.	10929	45.23381	-122.74897	4.5	6X	ODEQ
Pudding River at HWY 211 (Woodburn)	10640	45.26767	-122.70922	22.4	6X	ODEQ
Pudding River at HWY 99E (Aurora)	10917	46.07503	-123.83997	8.1	6X	ODEQ
South Santiam River at HWY 226 (Crabtree)	10366	44.63620	-122.92355	7.6	6X	ODEQ
South Yamhill River at HWY 99W	10948	45.25194	-123.17417	16.5	6X	ODEQ
Tualatin River at Boones Ferry Rd.	10456	45.38614	-122.75628	8.6	6X	ODEQ
Tualatin River at Elsner Rd.	10458	45.40939	-122.89367	16.2	6X	ODEQ
Tualatin River at HWY 210 (Scholls)	10459	45.45111	-122.94950	26.9	6X	ODEQ
Tualatin River at Rood Bridge	10461	45.49006	-122.95055	39.0	6X	ODEQ
Willamette River at Albany (HWY 20)	10350	44.63972	-123.10578	119.3	6X	ODEQ
Willamette River at Canby Ferry	10339	45.30033	-122.69072	34.4	6X	ODEQ
Willamette River at Hawthorne Bridge	10611	42.45544	-122.85503	13.2	6X	ODEQ
Willamette River at HWY 126 (Springfield)	10359	44.04561	-123.02675	185.3	6X	ODEQ
Willamette River at HWY 34 (Corvallis)	10352	44.56553	-123.25542	131.4	6X	ODEQ
Willamette River at HWY 99E (Harrisburg)	10355	44.26717	-123.17367	161.2	6X	ODEQ
Willamette River at Marion Street (Salem)	10555	42.00714	-124.18614	84.0	6X	ODEQ
Willamette River at SP&S RR Bridge (Portland)	10332	45.57795	-122.74750	7.0	6X	ODEQ
Willamette River at Swan Island Channel	10801	44.70936	-122.97378	0.5	6X	ODEQ
Willamette River at Wheatland Ferry	10344	45.09058	-123.04430	71.9	6X	ODEQ
Yamhill River at Dayton	10363	45.22364	-123.07159	5.0	6X	ODEQ

2.1.1 Changes to Sampling Sites

Sampling locations for this project are sometimes changed due to changes in resources, safety concerns, or changes in program priorities. Since long-term water quality trending is one of the uses of the data these sampling location changes are made infrequently and only when necessary. Table 4 is a list of historical stations no longer in use and the date when data collection at the site was discontinued.

Table 4 – Historical Stations Not Currently In Use

Station Number	Site	Latitude	Longitude	River Mile	End of Ambient Period of Record
	Columbia River Mainstem				
23800	Columbia River at Cathlamet Marker 41	46.22068	-123.42420	37.0	10/2003
23797	Columbia River at Kalama Marker 59	45.97012	-122.82632	78.0	10/2003
23794	Columbia River at Warrendale Marker 88	45.61328	-122.02803	141.0	10/2003
	Goose and Summer Lake Basin				
10743	Chewaucan River at Paisley	42.40714	-119.90105	27.3	09/2006

Station Number	Site	Latitude	Longitude	River Mile	End of Ambient Period of Record
	Malheur Lake Basin				
12257	Silvies River at Gravel Pit Road	43.65239	-119.08853	21.0	09/2006
12268	McCoy Creek at McCoy Creek Ranch	42.97567	-118.71572	11.0	06/2001
	Mid Coast Basin				
10392	Siuslaw River at HWY 126 (Mapleton)	44.03014	-123.85214	20.5	05/2006
	McKenzie Sub basin				
10663	Mohawk River at Hill Road	44.05528	-122.83122	1.6	05/2006
12655	Blue River at Blue River Drive	44.15545	-122.33978	0.3	05/2006
12656	South Fork McKenzie River at Nat'l Forest Rd. 19	44.15733	-122.25914	3.9	05/2006
12657	McKenzie River at HWY 126 (d/s Clear Lake)	44.35625	-121.99561	89.0	05/2006
	Middle Willamette Sub basin				
10342	Willamette River at Newberg Bridge	45.26764	-122.94236	48.6	04/2003
	Owyhee Sub basin				
12259	Jordan Creek at Mouth	42.8625	-122.6406	0.1	07/1999
10730	Owyhee River at Rome	43.78381	-117.05439	123.9	07/1999
	South Coast Sub basin				
11485	Middle Fork Coquille River at HWY 42 (Hoffman St Pk)	43.03305	-124.11333	0.2	3/2013

2.2. Sampling Methods

Sampling will be accomplished using the standard DEQ protocol described in the ODEQ Laboratory MOMs Manual (DEQ03-LAB-0036-SOP). Specific sample preservation methods and holding times are summarized in Table 5 below.

2.3. Sample Handling and Custody Procedures

Samples for laboratory analysis will be preserved as identified in Table 5 and held on ice. Routine ODEQ sample custody protocols will be followed. Refer to the ODEQ laboratory's *Sample Receiving and Control* SOP (DEQ06-LAB-0054-SOP). See Table 5 below for sample quantities, containers and Preservation requirements.

Table 5 Sample Preservation and Holding Times

ANALYTE	SAMPLE COLLECTION[i]	CONTAINER[ii]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[iii]
Alkalinity	All	1L Poly	100 mL	Cool $\leq 6^oC$	14 days
BOD_5	All	1L Poly, BOD Bottle	300 mL	Cool $\leq 6^oC$	48 hours
Chlorophyll	All, May-Oct	Petri dish	250 mL/1 glass fiber filter	Field Filter, $MgCO_3$, dry ice, Avoid light	28 days
COD	ODA	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6°C	28 days
Conductivity	All	Sampling bucket, 1L Poly	50 mL	Cool $\leq 6^oC$	28 days
Dissolved Oxygen (DO)	All	Sampling bucket, P	300 mL	Cool $\leq 6^oC$	0.5 h, 8h/8h[iv]
Bacteria, non-chlorinated (Escherichia. coli, Fecal coliform, Total coliforms)	All	Sterile Plastic Bac-T	100 mL	Cool $\leq 6^oC$	8 hours NPDES compliance 24 hours non-compliance
Ammonia nitrogen	All	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6°C	28 days
Nitrate+Nitrite nitrogen	All	500mL Poly	50 mL	H2SO4 pH <2, Cool < 6oC	28 days
Total Kjeldahl Nitrogen	ODA	500mL Poly	50 mL	H2SO4 pH <2, Cool $\leq 6^oC$	28 days
Ortho Phosphate	All	250 or 500mL Poly	100 mL	Field Filter, Cool $\leq 6^oC$	48 hours
pH	All	Sampling bucket, 1L Poly	100 mL	Cool $\leq 6^oC$	Immediate (24 hrs)
Pheophytin	All, May-Oct	Petri dish	250 mL/1 glass fiber filter	Field Filter, $MgCO_3$, dry ice, Avoid light	7 days
Sulfate	ODA	250mL, 500mL, 1L Poly	50 mL	Field Filter, Cool $\leq 6^oC$	28 days
Solids(Dissolved, Total, or Suspended)	All	1L Poly	200 mL ea	Cool $\leq 6^oC$	7 days

ANALYTE	SAMPLE COLLECTION[i]	CONTAINER[ii]	MIN. QUANTITY	PRESERVATION	HOLDING TIME[iii]
Total Organic Carbon	All	500mL Poly	10 mL	H2SO4 pH <2, Cool < 6°C	28 days
Total Phosphate	All	500mL Poly	100 mL	H2SO4 pH <2, Cool < 6°C	28 days
Turbidity	All	Sampling bucket, 1L Poly	50 mL	Cool $\leq$ 6°C	48 hours

[i] Sample collection: "All" means sample is collected at each site during each survey batch; ODA: samples collected only at ODA sites; "All, May-Oct" means samples are collected at all sites during the months of May to October only.

[ii] Wide Mouth Jars (4, 6, or 8 oz) can be used for all soil analyses with the exception of Volatile Organics. Preservation for soil samples is Cool < 6°C in almost all cases, freezing may extend the HT for some parameters.

[iii] Holding Time for water and soil samples may be different.

[iv] Analyze immediately. Winkler allows stabilization & holding for 8 hours until titration.

2.4. Analytical Methods

All of the contaminants of concern for this project are listed in Table 6. All laboratories involved with this project will make analytical SOPs available upon request. The laboratories' analytical SOPs must cite the methods identified in Table 6. Field analytical methods can be found in the Watershed Assessment Mode of Operations Manual MOMs (DEQ03-LAB-0036-SOP) which is available on the DEQ Laboratory website at, http://www.deq.state.or.us/lab/techrpts/technicaldocs.htm.

2.5. Quality Control

With each procedural step that a QC element can be implemented, environmental data will be batched with the QC result in which the samples or data were processed. With the knowledge of an unacceptable error in the QC measurement, environmental samples within the QC batch are either reprocessed after improvements are made to minimize the observed error, or the environmental data will be flagged as not meeting the quality control standard. If more than one of the same QC is performed in the batch only the environmental data preceding the failed QC is qualified. Batch QC control limits are summarized Table 6.

2.5.1 Quality Management Plan:

As noted in section 1.8 above, quality documents are controlled. One such document is the Agency Quality Management Plan itself. The most current QMP is available at \\deqlead02\QA_Documents\QMP\DEQ15-HQ-0014-QMP.PDF . With the approval of the QMP, EPA has granted the ODEQ laboratory QA section the authority to approve QAPPs, which EPA requires for all projects they fund.

This project will comply with the policy and procedures outlined in the QMP.

2.5.2 Quality Assurance Project Plan:

This QAPP complies with the agency's QMP. Changes to the QMP that affect the procedures for writing a QAPP may require revisions to this plan. This QAPP should be reviewed with the next revision of the QMP.

The LPM will assign a DQL of "B" to environmental data collected without an approved Quality Assurance Project Plan or Sampling and Analysis Plan.. The LPM will review QC summary data at the end of the project and flag project data if insufficient QC data is collected or there are apparent systematic errors.

2.5.3 Survey:

The grouping of all the samples collected for a project during specific time period is called a **survey**. The survey period for this project is the calendar year. The survey title will be the calendar year and Survey Batch the month. Staff collecting the sample will enter survey (year) and batch (month) onto the Chain of Custody (COC) which will then be transcribed into ELEMENT™. The intent of the Survey field is to provide a convenient means to query the database for all data generated for the project during the survey period. The project managers may use this queried data to evaluate project completeness (e.g.: % of analyses completed within the analytical holding time, % of analyses completed within project turnaround time target, % of analyses with level "A" data quality) as the project progresses.

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2.5.4 Survey Batch:

The **survey batch** is a subset of the survey. For the Ambient Water Quality Monitoring Program survey batch is defined as the calendar year and month (e.g.: 2013-May). The **survey batch plus project** (as defined in Element) is used to reflect how the samples are grouped relative to project field QC samples (Example: 2013-May, Umpqua/south Coast. These samples were collected during a one week period by a specific sampling team may only have 1 Duplicate or one blank; and may be received by the sample custodian as separate work orders). All of the samples associated with the Duplicate and Blank are in the sample survey batch. Control measures applied to the survey batch should have the expectation that they would be constant within the survey batch but posses more variability across survey batches.

Each sampling team will collect at least one equipment blank and one duplicate set of samples for each survey batch. For survey batches with a large number of samples the field sampling team will collect approximately 1 duplicate sample per ten samples. If laboratory corrective action cannot rectify apparent equipment blank or duplicate error all related environmental data within the survey batch will be qualified.

The LPM or QA officer will qualify and assign a DQL of "B" to environmental results if equipment blank or field duplicate data fail to meet control limits for the entire sampling survey batch

For duplicates: If sufficient evidence is available to establish that the error was isolated to the primary/duplicate sample pair, only the primary sample result will be assigned a DQL of "B" rather than the entire survey batch).

For blanks: Only detected results less than 10x the level of contamination need qualification if there is contamination in the equipment blank.

During the initial survey for the project each sampling team will collect an equipment, transfer, transport, and lab retained blanks with each work order. The laboratory will hold the transfer, transport, and lab retained blanks without analysis until after the equipment blank data is reviewed. Previous experiences with similar matrices have not demonstrated that there is a problem with equipment blanks. Thus transfer, transport, and lab retained blanks will not be collected; unless at some point during the project equipment blank errors become more frequent.

If the equipment blank exceeds the control limits, the laboratory will analyze the transfer, transport, and lab retained blanks when they are available to assess the source of the error. With the information available the laboratory will advise the QAO and LPM and assist in the development of quality improvement strategies. If there appears to be no problem with the equipment blank, the LPM will advise the assessment team to not collect the transfer, transport, and lab retained blanks during subsequent surveys.

The control limits in Table 6 are based lab duplicates and lab blanks. It is anticipated that field blanks and duplicate sample QC measurements will exceed set limits more frequently than similar laboratory controls. Thus survey control limits may be adjusted in future revisions of this QAPP. In the mean time the equipment blank control limits are equal to that of the method blank and the duplicate sample control limits are equal to the laboratory replicate control limits.

The sampling teams will also measure the turbidity, temperature, pH, alkalinity, dissolved oxygen and specific conductivity each equipment blank. If necessary the sampling team may request that the laboratory repeat the analysis of the alkalinity, pH, and/or specific conductance.

The LPM will flag environmental results as and assign a DQL of "B", if equipment blank or field duplicate data fail to meet control limits for the entire sampling survey. Unless sufficient evidence is available to establish that the error was isolated to the primary/duplicate sample pair, in which case only the primary sample result will be flagged and assigned the DQL of "B".

2.5.5 Work order:

A "work order" is typically a group of samples shipped at the end of the day by each individual sampling team that has the same Q-time number (also see "Sampling Event" in Section A4 *Definitions*). The group of samples collected from the stations listed in Table 3 may require multiple collection teams over multiple days, i.e. multiple Work orders. During a work order multiple coolers may be filled with samples and transported to the laboratory. The sample coordinator will attempt to log the samples into LIMS under the same work order ID number.

The sample custodian will randomly select a sample from each survey batch from the day the field duplicate is collected, which will be used to repeat field parameters in the laboratory (field audit sample). If the difference between the field and laboratory measurements exceeds the precision control limits set in Table 6, the laboratory will repeat all of the field parameters within the work order. The laboratory analyst will email the LPM of the corrective action, who will assess the error and determine if the field/lab variance is attributable to factors other than the accuracy of the field parameter. If appropriate, the LPM will ensure the DQL is set to "B" for all results when work order is approved.

2.5.6 Location:

All environmental data generated from samples collected at a station may be flagged based on observations made by the sampling team and supporting data. The sampling station should appear to be indicative of normal homogeneous ambient conditions. Access to the sample location within the stream should not be impaired. The sampling team will note on their field sheet if an obstacle prevents collecting the sample at the specified location and time (Table 3). The sampling should occur within 15 feet of the station ID. The LPM will flag environmental results not obtained from the scheduled stations as "B" data. Analytical data not collected as scheduled due to unforeseen circumstances will be cancelled and assigned a DQL of "D".

2.5.7 Collection:

The sample team will collect samples using the techniques described in section B3. If circumstances dictate other sampling techniques the sampling team will make the note on their field form. For techniques that are considered equivalent the data will not be flagged. If, however, the technique is not equivalent the LPM will flag environmental results and assign a DQL of "B".

2.5.8 Transport Container:

The sampling team will pack the collected samples and the field forms into coolers along with a temperature blank sample. The temperature of the temperature blank will be checked at the time of sample receipt. If the temperature does not fall between 0° – 6° C or, for samples received the same day of collection, the samples were not received on ice, all measurements requiring thermal preservation will be commented by the sample custodian and flagged in the lab with a qualifier in the report. Additionally, the DQL of "B" is assigned if the sample temperature is > 10^{o}C.

If there is uncertainty (incorrect or illegible) of the sample ID or sampling location, the sample custodian will comment into Element™ and the lab staff will apply a "V" qualifier in Element™ which will "Void" the sample and apply a DQL of "D" if the information cannot be rectified by the field personnel.

If the Sample ID and Location are correct:

> If the sampling date is in question, all data relating to that sample are qualified with an associated DQL of "C" if the information cannot be rectified by the field personnel.
>
> If the sampling time is not recorded and there is no impact on holding time compliance, the DQL may remain as "A", however if there is potential impact on the holding time, the DQL will be set to "B".

2.5.9 Bottle/Filter/Probe:

During sample receipt the sample coordinator will examine each container.

If a container is damaged, or an inappropriate container was used for the requested analysis; the sample custodian will comment into Element™ and the lab staff will flag all analytical results and apply a DQL of "B" or using professional judgment, flag the sample with a "V" (Void).

If the container is mislabeled and cannot be rectified through discussion with field personnel, the sample custodian will comment into Element™ and the lab staff will flag all data affected by the sample container with a "V" (Void) with an associated DQL of "D".

2.5.10 Receipt:

The sample coordinator must document their inspection of the samples integrity upon receipt. Technical Services will verify that sample receipt documentation is complete, data are qualified where appropriate, and the proper analyses are assigned. Personnel reviewing the Sample Coordinator's work will sign for their review and will flag results and assign a DQL of "B", if corrective action does not resolve the integrity of the sample.

2.5.11 Storage:

The Sample Coordinator will transfer samples requiring refrigeration into refrigerators. Technical Services will record the temperature of the refrigerators daily. A DQL of "B" will be applied as needed to affected samples for all analytical data that is measured from samples stored in a faulty refrigerator.

2.5.12 Work-list:

The Organic, Inorganic, and the field monitoring Sections of the laboratory will assign staff to peer review data records. Peer review shall verify that calibrations, sample data reduction, and data reporting were accurate. Personnel reviewing the analyst's work will sign for their review and will qualify results and assign a DQL of "B", if corrective action does not resolve sample/data integrity errors. This process provides assurances that data is of known quality.

2.5.13 Sub-sample:

Occasionally heterogeneous samples must be split into new containers after receipt at the laboratory. For this project samples containing mixed media should not be split into different containers without first homogenizing the sample. If it is determined during the peer review that the sample was mishandled the analytical results will be flagged and assigned a DQL of "B".

2.5.14 Preparation Batch:

The **preparation batch** is defined as the environmental samples that are prepared and/or analyzed together by the same personnel, using the same process and lot(s) of reagents. A preparation batch is composed of one to twenty matrix defined environmental samples with a maximum time of 24 hours between the start of processing of the first sample and the completion of the last sample. An analyst may prepare more than twenty samples during the day; however each group of twenty samples must be identified as a unique batch.

At least one **method blank** will be prepared with each preparation batch. A method blank is a "clean" water sample (e.g. containing no analyte of concern), which is processed through all the analytical protocols. If the concentration of a targeted analyte in the blank is above the LOQ and is greater than 1/10 of the amount measured in the sample, the analyte will be qualified and assigned a DQL of "B".

The laboratory will also prepare a **Laboratory Control Sample** (LCS) with each preparation batch. The LCS is defined as sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. If the LCS fails to meet the laboratories control limit and samples cannot be re-analyzed, all associated environmental data within the preparation batch is qualified. Where possible, the LCS should be traceable to NIST, however standard reference materials may be used as well. The LCS's are typically mid-range in the calibration curve and used to assess the accuracy of the analysis. Control limits are based on historical data, or limits published in the method. If the LCS fails to meet control limits, the analyst will qualify all parameter results within the preparation batch and assign a DQL of "B". **Note:** If sample results are ND and LCS has a high bias, the DQL is not changed, however a qualifier should still be added to the LCS only to reflect the bias.

2.5.15 Calibration:

All measurement systems must be calibrated meeting specific requirements. Calibration requirements are divided into three parts:

- requirements for analytical **support equipment**,
- requirements for **standardizing the** test method **titrant**, and
- requirements for **instrument calibration**, which is further divided into
    - initial instrument calibration and
    - continuing instrument calibration verification

Support Equipment: Since support equipment is calibrated quarterly or annually as required by current standards, it is possible for analytical data to be reported using inaccurate support equipment for quite sometime after data is reported. Should the calibration of support equipment fail to meet control limits, all analytical data generated with the piece equipment prior to the failed calibration up to the last acceptable calibration shall be qualified and assigned a DQL of "B".

Titrant Standardization: Dissolved oxygen and alkalinity titrants must be calibrated using primary reference standards. Each batch of sodium thiosulfate used for dissolved oxygen will be standardized with a primary potassium bi-iodate standard and each batch of *0.02 N* sulfuric standard used for alkalinity shall be standardized using a *0.05 N* calcium carbonate primary standard. The calibration batch ID will be recorded on the titrant bottle and transcribed to the field work order sheet to ensure results are traceable to NIST.

Instrument Calibration: Immediately following the initial "instrument calibration" an **Initial Calibration Verification** sample (ICV) must be analyzed to verify the accuracy of the calibration standards. If the ICV fails to meet control limits, the analyst must determine the significance of the error and qualify the results and assign all affected data within the calibration batch with a DQL of "B" or "C" depending on the severity of the failure.

The lowest calibration standard used will be equal to the laboratory's **Limit Of Quantitation** (LOQ). As noted in section 1.8.3, some project target levels (Table 6) analytes may be below the laboratory's LOQ. Such analytes are to be reported to the laboratory's Limit Of Detection (LOD). If the datum is greater than the projects target level and less than the laboratory's LOQ will be flagged as an estimate (J flag). If the analyte is less than the LOD, it will be reported as less than the LOD.

2.5.16 Analytical Batch:

The analytical batch is defined as a group of environmental samples that is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. If there are no preparation steps the analytical batch definition is the same as the preparation batch definition.

A high to mid-range calibration standard is to be used for a continuing calibration verification (CCV) standard. A CCV is analyzed at the beginning of the analytical batch and at a frequency specified in the analytical methods or lab SOPs. The CCV is used to verify that the initial calibration is still valid and to assess calibration drift. A CCV sample are usually near a mid range of the calibration curve. The CCV must fall within method specified control limits all data reported with a trailing CCV that fails to meet the control limit are to be qualified if they and the associated samples cannot be reanalyzed. If the CCV fails to meet control limits and if the samples cannot be reanalyzed, the analyst will qualify all affected results in the Analytical Batch and assign a DQL of "B". *Exception to CCV flagging*: If, after review of the data, it can be assessed that CCV has a high bias (and not a result of standard preparation error) and samples are ND, the DQL would not change, however a comment qualifier should still be added in ELEMENT^{TM} to reflect the CCV bias.

2.5.17 Analyte QC:

Each laboratory will replicate the analysis of an environmental sample with every analytical batch of twenty samples. If the laboratory's control limit is exceeded the sample result must be flagged. When analytes are not detected in the environmental samples and it is feasible to perform a matrix spike, the laboratory will prepare matrix spike/matrix spike duplicate samples to estimate analytical precision.

Matrix spikes are to be analyzed at the frequency of one in every twenty environmental samples. The method-specific criteria for spike recovery are located in Table 6. Spike recoveries are used to determine the analytical accuracy of the test method for the specific sample matrix. Sample dilution may be used to minimize interference. Some methods require the use of an interference check standard, which ensures that corrections for interferences are made.

Table 6 – Data Quality Indicators

Parameter	Units[i]	Method	Target[ii]	Precision[iii]	Accuracy[iv]			
					MS	LCS	CCV	ICV
Field Measurements								
Dissolved Oxygen	mg/L	Hach 10360	0.2	≤ ± 0.2 mg/L	N/A	N/A	N/A	-0.3 to +0.4
Percent DO Saturation	%	Hach 10360	N/A		N/A	N/A	N/A	N/A
Temperature	°C	EPA 170.1	1	± 0.5	N/A	N/A	N/A	≤ ± 0.5[v]
pH	S.U.	EPA 150.1	Sensitivity to 0.1	± 0.3	N/A	± 0.2[vi]	N/A	≤ ± 0.2[vii]
Specific Conductivity (@ 25°C)	µmhos/cm	EPA 120.1	1	± 10%	N/A	N/A	±7%	±7%
Turbidity	NTU	SM 2130 B	1	± 20%	N/A	N/A	±10%	±10%
Microbiological Examination								
Escherichia Coli (E.Coli)	MPN / 100mL	SM 9223B	1	0.6 (log)	N/A	Positive Confirmation	N/A	N/A
Physical & Aggregate Properties								
Total Dissolved Solids	mg/L	2540 C	10	± 20%	N/A	± 20%	N/A	N/A
Total Solids	mg/L	2540 B	10	± 20%	N/A	± 20%	N/A	N/A
Total Suspended Solids	mg/L	2540 D	1	± 20%	N/A	± 20%	N/A	N/A
Alkalinity	mg/L	2320 B	1	± 10%	N/A	± 20%	± 0.3 pH	± 0.1 pH
Bicarbonate Alkalinity	mg/L	2320 B	1	± 10%	N/A	± 20%	± 0.3 pH	± 0.1 pH
Conductivity	µmhos/cm	120.1/2510 B	1	± 5%	N/A	N/A	± 2%	± 2%
Turbidity	NTU	180.1/2130 B	1	± 20%	N/A	± 10%	± 10%	± 10%
pH	SU	150.1/4500-pH B 9040B / 9045C	Sensitivity to 0.1	± 0.2 pH	N/A	± 0.1 pH	± 0.2pH	± 0.1 pH
Inorganic Non-Metals								
Ammonia	mg/L	ASTM D6919-09	0.01	± 20%	± 20%	± 10%	± 10%	± 10%
Nitrate/Nitrite	mg/L	353.2/4500NO_3F	0.005	± 10%	± 20%	± 10%	± 10%	± 10%
Total Kjeldahl Nitrogen	mg/L	351.2/4500N_{org}D	0.2	± 20%	± 20%	± 20%	± 10%	± 10%
Sulfate by IC	mg/L	300.0/ 9056A	0.2	± 10%	± 20%	± 10%	± 10%	± 10%

Parameter	Units[i]	Method	Target[ii]	Precision[iii]	Accuracy[iv]			
					MS	LCS	CCV	ICV
Biochemical Oxygen Demand,5 Day Un-Diluted Stream	mg/L	5210 B	0.4	≤± 0.3 mg/L (Field)	N/A	N/A	N/A	N/A
Orthophosphate	mg/L	4500P E	0.005	± 10%	± 20%	± 10%	± 10%	± 10%
Total Phosphorus	mg/L	4500P B,E	0.01	± 10%	± 20%	± 10%	± 10%	± 10%
Organic: Aggregate Constituents & Properties								
Chemical Oxygen Demand	mg/L	5220D	5 or 10	± 20%	± 25%	± 15%	± 10%	± 10%
Total Organic Carbon	mg/L	415.1/5310B / 9060	1.0	± 20%	± 25%	± 15%	± 10%	± 10%
Chlorophyll and Phaeophytin	µg/L	SM10200 H	0.1	± 20% (Field)	N/A	N/A	± 10%	± 10%

[i] The units of the QC (Target, Precision, and Accuracy) limits are listed in this column. If the QC limit is reported with a "%" sign it is unit-less.

[ii] The target level is the anticipated reporting level for this project. A target level of "LOQ" means the laboratory will use its current LOQ. LOQs may be found in the specific ELEMENT analysis codes. If the requested target level is less than the laboratories LOQ, the laboratory will estimate the result down to the laboratory's LOD. The laboratory will not report values less than its LOD.

[iii] The precision control limit is to be used to evaluate both field duplicate and laboratory duplicate samples. Use the laboratory's current duplicate control limits, unless specified otherwise.

[iv] Actual laboratory control limits may vary, since laboratories are expected to revise control limits over time. Some QC measures are not applicable (NA) to the test method. Use the laboratory's current accuracy control limits, unless specified otherwise.

[v] Thermometer Accuracy checked with NIST standards.

[vi] Low ionic control sample.

[vii] Low ionic control sample.

2.6. Instrument/Equipment Testing, Inspection, and Maintenance

All analytical equipment will be maintained and inspected in accordance with the procedure's test method SOPs. All DEQ test method SOPs are controlled documents and are available on Q-net at http://deq05/lab/qms/documents.asp. Field parameter SOPs are outlined in DEQ MOMs manual.

The laboratories will keep maintenance logs on all analytical equipment. Laboratories are expected to conduct routine maintenance procedures and follow the manufacture's advice. Personnel conducting peer review will find it helpful to use maintenance logs during corrective action procedures.

2.7. Instrument Calibration and Frequency

All analytical equipment will be calibrated in accordance with the procedures test method SOPs. Field parameter SOPs are outlined in DEQ MOMs manual.

If instruments can not be calibrated as required, the analyst will flag data as appropriate (refer to section 2.5.15).

2.8. Inspection/Acceptance of Supplies and Consumables

The analyst will be responsible for maintaining records of traceability for all reagents and standards. The procedure used to maintain traceability is described in the Laboratory Quality Manual (DEQ91-LAB-0006-LQM). The analyst must validate the usability of standards and reagents upon receipt and when expiration dates are exceed.

2.9. Non-direct Measurements

Data management will be provided through the ODEQ LIMS and the web accessible database.

Separate field data sheets will be maintained for each work order. Information recorded on data sheets is to include Project name, sample location identification, data and time of work orders, water body name, basin name, station ID numbers, general weather conditions, and names of field staff, time of each sample or measurement, results and equipment ID numbers. All data are to be entered into the DEQ the web accessible database.

The LPM will coordinate with the DEQ Laboratory technical services staff to input field data and third party data into the DEQ LIMS and the web accessible database. Technical services will enter data as it is received and will not correct errors. The LPM will verify and correct data transcribed into LIMS, ensuring data meet LEAD reporting policies. Refer to the LEAD's *Quality Manual* (DEQ91-LAB-0006-LQM).

Analytical data generated by the laboratory will be sent to the project coordinator as an electronic PDF report. The DEQ Laboratory will maintain hard copies of the analytical reports, including all analytical QC measurements. Data generated by the DEQ laboratory will be moved to an external web accessible data repository database following release by the LPM.

2.10. Data Management

Data management will be provided through the ODEQ LIMS and the web accessible database.

Separate field data sheets will be maintained for each work order. Information recorded on data sheets is to include Project name, sample location identification, data and time of work orders, water body name, basin name, station ID numbers, general weather conditions, and names of field staff, time of each sample or measurement, results and equipment ID numbers. All data are to be entered into the DEQ the web accessible database.

The LPM will coordinate with the DEQ Laboratory technical services staff to input field data and third party data into the DEQ LIMS and the web accessible database. Technical services will enter data as it is received and will not correct errors. The LPM will verify and correct data transcribed into LIMS, ensuring data meet LEAP reporting policies. Refer to the LEAP's *Quality Manual* (DEQ91-LAB-0006-LQM).

Analytical data generated by the laboratory will be sent to the project coordinator as an electronic PDF report. The DEQ Laboratory will maintain hard copies of the analytical reports, including all analytical QC measurements. Data generated by the DEQ laboratory will be moved to an external web accessible data repository database following release to the LPM.

3. Assessment and Oversight

3.1. Assessment and Response Actions

Surveillance and data management will be performed at least once a month to ensure data being collected will meet the needs of the project. All results of the individual assessments will be complied and managed by the LPM.

Response actions will be developed as data becomes available. Any stop work orders or change in project scope will come from the LPM. Corrective actions will be documented as addendums to this QAPP/SAP.

3.2. Reports

Technical Services will file all Table 7 information and records together in a single work order file that is reviewed by the LPM prior to the release of the data. Information is available to all staff through ELEMENT throughout the sampling - reporting process. DEQ LEAD may make these reports available to the public upon request.

Table 7 – Laboratory Reports

Official Analytical Report (includes Batch QC results)
Project Summary Report – When applicable
Analytical Peer review checklists
Original Field Data Records
Sample Receipt Checklist
Sample Preservation Summary
Technical Corrective Action
Field QC report
Laboratory Audit of Field Measurements
Solids Balance/QC Form
Ion Balance Report
Third Party Data – When applicable

4. Data Validation and Usability

Data is reviewed, qualified and validated validated according to DEQ guidance document *Data Validation and Qualification* (DEQ09-LAB-0006-QAG). Throughout the sampling, analysis, reporting, and project review process, various staff members are reviewing and evaluating the information against various quality criteria as specified in QA Plans and/or LEAP SOPs. If any of the items are outside of the specified QA/QC criteria, a decision must be made as to the limitations on the usability of the information (if any). Affected samples are qualified in LIMS (Element™) to explain any limitations. A list of data flags with definitions, DQL and guidance on how to apply them is available at file://deqlead-lims/serverfolders/ElementGuidanceDocuments/ElementQualifierUsage.pdf. Data quality levels shown below in Table 8 are those that are listed in the guidance document but are presented here for convenience.

The DQLs are used as a simplify database queries of quality data and as a simplified indicator of data suitability for THIS project (the suitability of the data by others must be determined based on their own individual data needs). Data not meeting the data quality indicator control limits will receive a DQL other than "A". If a QC measure fails to meet control limits, personnel evaluating the QC must flag all results associated with the particular QC failure. The DQL will be set to "B" or "C" depending on the severity of the failure or the analyst may void the result and set the DQL to "D". Comments will be linked to the results explaining QC failures.

If the QAO determines the data does not meet the data quality objectives described in section 1.8 the DQL of all affected results will be adjusted to the appropriate code defined in Table 8.

Table 8 – Data Quality Levels

DQL	Definition	Description
A	Data of known Quality;.	meets QC limits established in a DEQ approved QAPP
B	Data of known but lesser quality;	Data may not meet established QC but is within marginal acceptance criteria; or data value may be accurate, however controls used to measure Data Quality Objective (DQO) elements failed (e.g., batch failed to meet blank QC limit); the data is generally usable for most situations or in supporting other, higher quality data. **(Equivalent to the "J" (estimated) qualifier used by EPA)**
C	Data of unacceptable quality.	Generally due to QC failures but may be related to other known information about the sample. Data should not be used for quantitation purposes but may have qualitative use. **(Equivalent to the "R" (rejected) validation qualifier used by EPA**).
D	No data available	No sample collected or no reportable results. Samples are either voided or canceled.
E	Data of unknown quality.	Insufficient QA/QC or other information available to make determination. Data could be acceptable; however, no evidence is available to prove either way. Data is provided for Educational Use Only.
F	Exceptional Event.	Exceptional Event; "A" quality data (data is of known quality), but not representative of sampling conditions as required by project plan.(e.g., an air particulate sampler fails to sample the full time period because adverse conditions such as a forest fire overloaded

DQL	Definition	Description
		the sampling equipment)

Data with a DQL of "B" may be used for this project.

Precision requirements for the field measurements (conductivity/salinity & turbidity meters, etc.) are consistent with the Data Quality Matrix DEQ04-LAB-0003-QAG.

4.1. Data Review, Verification and Validation

The PM, LPM or the QA officer and the data coordinator will determine if the data collected meets the QA Plan objectives. The LPM will review all data resulting from this project as data becomes available. Questionable data will be brought to the PM and QA officer. Decisions to accept, qualify or reject data will be made by the PM, LPM or QA officer.

The LPM will verify all parameters requested were reported and that data were reported to the requested target levels and with the appropriate units. If data are reported incorrectly, the LPM will be responsible for ensuring corrections to the database are made.

4.2. Verification and Validation Methods

The data review process will be monitored through the use LIMS sample status codes. The analyst will enter, review analytical data, and flag results not meeting test method SOP defined QC standards. A second qualified analyst will review QC batch data and sign off on data in LIMS as having been reviewed. Documentation of the peer review will be maintained using an Analytical Data Review Checklist (DEQ07-LAB-0055-TMPL) developed for each method.

The inorganic and organic laboratory sections will review data grouped together in the same work order as it relates to the test results reported by their section. This level of review will include the review of the peer review checklist, inter-parameter comparisons, history comparisons, LIMS comments, laboratory QC checks on field measurements, correspondences with sampling teams, and compliance with QAPP requirements.

The LPM will review work order batch data in LIMS and ensure that field data was transcribed and qualified correctly in LIMS. During this review the LPM will ensure batch data meets control limits and that samples were flagged with appropriate data qualifiers and corresponding results were assigned the appropriate DQL. Data quality levels (DQLs) will be assigned in accordance with this Quality Assurance Project Plan and the revised *DEQ Guidance: Data Validation and Qualification* DEQ09-LAB-0006-QAG. Generally, only DQLs of A or B will be acceptable for this project unless the basis for the data acceptability is approved and documented by the LPM.

The LPM must coordinate the approval of LIMS data with the other laboratory staff as necessary to verify QC elements are met and reset DQLs if necessary. This validation process is tracked in ELEMENT™. Once all data is completed through thelaboratory review process, the LPM will view a draft report and proofread it against the original field data sheets. Errors in data entry will be corrected at that time. Outliers and inconsistencies will be flagged for further review or be discarded. Data quality problems will be discussed as they occur and in the final report to data users.

Once all work order data has been reviewed and approved by the LEAP Project Manager the analytical report will be released. The LEAP Project Manager will print and sign the original report, deliver it to Technical Services for filing, and distribute the report as described in Table 7 – Laboratory Reports.

4.3. Reconciliation with User Requirements

As soon as possible after each work order, calculations and determinations for precision, completeness, and accuracy will be made and corrective action implemented if needed. If data quality indicators do not meet the project's specifications, data may be discarded and re-sampling may occur. The cause of the failure will be evaluated. If the cause is found to be equipment failure, calibration and/or maintenance techniques will be reassessed and improved. If the problem is found to be sampling team error, team members will be retrained. Any limitations on data use will be detailed in both interim and final reports, and other documentation as needed. If failure to meet project specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for the next sampling season. Revisions will be submitted to the QA section of the DEQ laboratory for review and/or approval.

Corrective action is initiated whenever an "out of control" condition is identified (e.g. either control limits or holding time has been exceeded). The analyst is responsible for initiating corrective action, which generally consists of:

- Analytical system recalibrated or verified and analysis repeated, if holding time permits.
- Documentation of "out of control" condition and corrective action taken in an Incident Report, which is reviewed by the section manager and QA officer, who investigate the "out of control" condition, along with the analyst, and decide on a course of corrective action.
- If corrective action procedures do not rectify "out of control" conditions the analytical data may be reported with qualifiers and the DQL be set to "B" (or "C" if really bad). A comment (qualifier) explaining the DQL change must also be included.
- If time for reanalysis exceeds the allowable holding time for the analyte, the following procedure is followed:
    - Sampler is notified and resampling is requested, or
    - If resampling is not feasible, and the particular analytical results are not critical, initial analytical results are reported with an explanatory qualifier indicating all QC criteria have not been met and the DLA is adjusted accordingly.
- Data identified as violating the data quality objective criteria will be reviewed by the QA officer, the appropriate laboratory section manager (organic or inorganic), and/or the LPM and a recommendation will be made to the LPM. The LPM will make a decision on the suitability and use of the data. Situations requiring corrective action for sample collection will be dealt with immediately, such as equipment malfunction. Sample collection events requiring corrective action that cannot occur immediately will be considered a long-term corrective action. The corrective actions will be detailed in the field sampling notebook and reviewed by the LPM.

If corrective action procedures do not mitigate the error, associated environmental data must be qualified and a DQL assigned. Table 8 lists the DQL levels. For this project, data with a DQL of "B" may prove to be acceptable for use. The PM should review flagged data and use their professional judgment to either omit or include non- "A" level data from the final data analysis.

5. Revision History

Revision	Date	Changes	Editor
1.1		Previous revision was not available in a useable electronic format.	Curtis Cude
1.2	10/15/2007	Revised to current QAPP format.	Chris Redman
2.0	03/24/2008	Updated station tables, added priority pollutant metals collection to Willamette River Basin sites, field duplicate and blank wording clarified and USGS gage station link added.	Allen Hamel
2.1	1/19/2010	Added web ID number and added dissolved organic carbon and sulfate analyses. Revised sections, including 2.5.3, 3, and Added section.	Allen Hamel Chris Redman
2.2	5/6/2010	Mostly editorial edits throughout and corrections to Table 3 (Sample Locations) per L.Marxer	Larry Marxer Scott Hoatson
	4/21/2013	Updated Table 1: Distribution List to reflect staffing changes since last update. Minor clarifying addition to footnotes in Table 6: Data Quality Indicators.	Michael Mulvey

Revision	Date	Changes	Editor
3.0	9/18/2013	Revised to current QAPP format. Updated table 1 and Table 2: distribution list and responsibilities tables, to reflect staffing changes and changes in duties as a result of implementing the new laboratory information tracking system (Element). Updated Table 3 and Table 4: sample locations lists, to reflect addition of 19 new sits for the Oregon Department of Agriculture (ODA) and a minor location change at one site for safety reasons. Updated Table 5: sample preservation and holding time, to reflect changes in sample bottle nomenclature as a result in implementing Element laboratory information tracking system. Updated Table 6: data quality indicators, to reflect the additional parameters at ODA sites and in changes in short term special studies for priority pollutant metals at selected sites. Deleted old Table 5: survey sample locations. This table attempted to provide the daily schedule of sample locations per project. The information was very inaccurate and not in a useful format. This information is better documented and maintained in the individual project note books. Many minor changes to text for clarification, error correction, and elimination of obsolete passages, especially in text related to the table edits described above.	Michael Mulvey
3.1	9/25/15-5/19/2016	Updated Table 6, Data Quality Inidcators, to reflect current laboratory practices: dissolved oxygen precision changed from $<\pm 0.3$ to $<\pm 0.2$;biochemical oxygen demand target changed from 0.1 to 0.4 mg/L, precision changed from $\pm 20\%$ to $\leq +0.3$ mg/L, BOD method reference updated to the current BOD SOP. Also updated staff contacts.	Michael Mulvey

Appendix A Field Data Forms

There are three pages of field data forms for the Ambient Water Quality Monitoring Network: a chain of custody form for samples collected for laboratory analysis, a field data form, and field meter calibration log. Forms have the station identification number, station name and other information already filled out. Below are examples of these forms.

Electronic field data forms associated with this Sampling and Analysis Plan are located at \\DEQLEAD01\WQM\Ambient Network\Ambient Element Field Sheets. Field data forms are build into the LEAD's Chain of Custody Form (COC). The COC is a controlled form that is available on Q-Net (\\DEQLEAD02\QA_Documents\FORM\DEQ06-LAB-0054-FORM.xlsm.lnk) and must be used to revise COCs and field data forms to ensure the current approved QA record is being used as a template.

Chain of Custody Form

Oregon Department of Environmental Quality Chain of Custody Record [1] Page of

* Office Use Only *
Affix Work Order Barcode Here

Client[2]: *Ambient Water Quality Monitoring - DEQ*

Project[3]: *Willamette and Columbia Harbor* QAPP or SAP#[4]: *DEQ03-LAB-0041-QAPP*

Page: Survey[5]: Survey Batch[6]:

Sample Collector (s)[7]: *Michael Tichenor, 503-693-5733* mpling Agency[8]: *ODEQ* QTime Code[9]: *26296* TAT[10]: *45 days*

LEAD Coordinator and Contact #[11]: *Michael Mulvey, 503-693-5732* Report Recipients[12]: *Aaron Borisenko, 503-693-5723*

Sample Information						Bottle Types[20]										
Item[13]	LASAR ID #[14]	Collection Date[15]: Station Name[16]	Time[17]	Sample Type[18]	Report Matrix[19]	AG, 250mL; H2SO4	BOD 300 ml	Filter Glass - 47 mm	IDEXX 120 ml	Poly 1000mL	Poly 250mL; Filtered	Poly 500mL; H2SO4				
	10616	Columbia R. at Marker #47 (u/s of Willamette R.)			RS	1	1		1	1	1	1				
	11201	Columbia Slough at Landfill Rd.			RS	1	1		1	1	1	1				
	10332	Willamette R. at SP&S RR Bridge, Portland			RS	1	1		1	1	1	1				
	10801	Swan Island Channel midpoint			RS	1	1		1	1	1	1				
	10611	Willamette R. at Hawthorne Bridge, Portland			RS	1	1		1	1	1	1				

Event Comments:

Chain of Custody [21]

Relinquished By:	Agency/Company	Date/Time	Received by:	Agency/Company	Date/Time

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Field Data Form

Oregon Department of Environmental Quality Chain of Custody Record [1] Page of

* Office Use Only *
Affix Work Order Barcode Here

Client[2]: *Ambient Water Quality Monitoring - DEQ*

Project[3]: *Willamette and Columbia Harbor* QAPP or SAP#[4]: *DEQ03-LAB-0041-QAPP*

Page: Survey[5]: Survey Batch[6]:

Sample Collector (s)[7]: *Michael Tichenor, 503-693-5733* Sampling Agency[8]: *ODEQ* QTime Code[9]: *26296* TAT[10]: *45 days*

LEAD Coordinator and Contact #[11]: *Michael Mulvey, 503-693-5732* Report Recipients[12]: *Aaron Borisenko, 503-693-5723*

Sample Information					Field Data[19, 20]							
Item[13]	LASAR ID #[14]	Collection Date[15]: / Station Name[16]	Time[17]	Sample Type[18]	Cond umhos (X)	DO (Lum) mg/L (X.X)	DO Sat (Lum) % (X)	pH SU (X.X)	Temp °C (X.X)	Turb NTU (X)		Item Comment:
	10616	Columbia R. at Marker #47 (u/s of Willamette R.)										
	11201	Columbia Slough at Landfill Rd.										
	10332	Willamette R. at SP&S RR Bridge, Portland										
	10801	Swan Island Channel midpoint										
	10611	Willamette R. at Hawthorne Bridge, Portland										

Event Comments:

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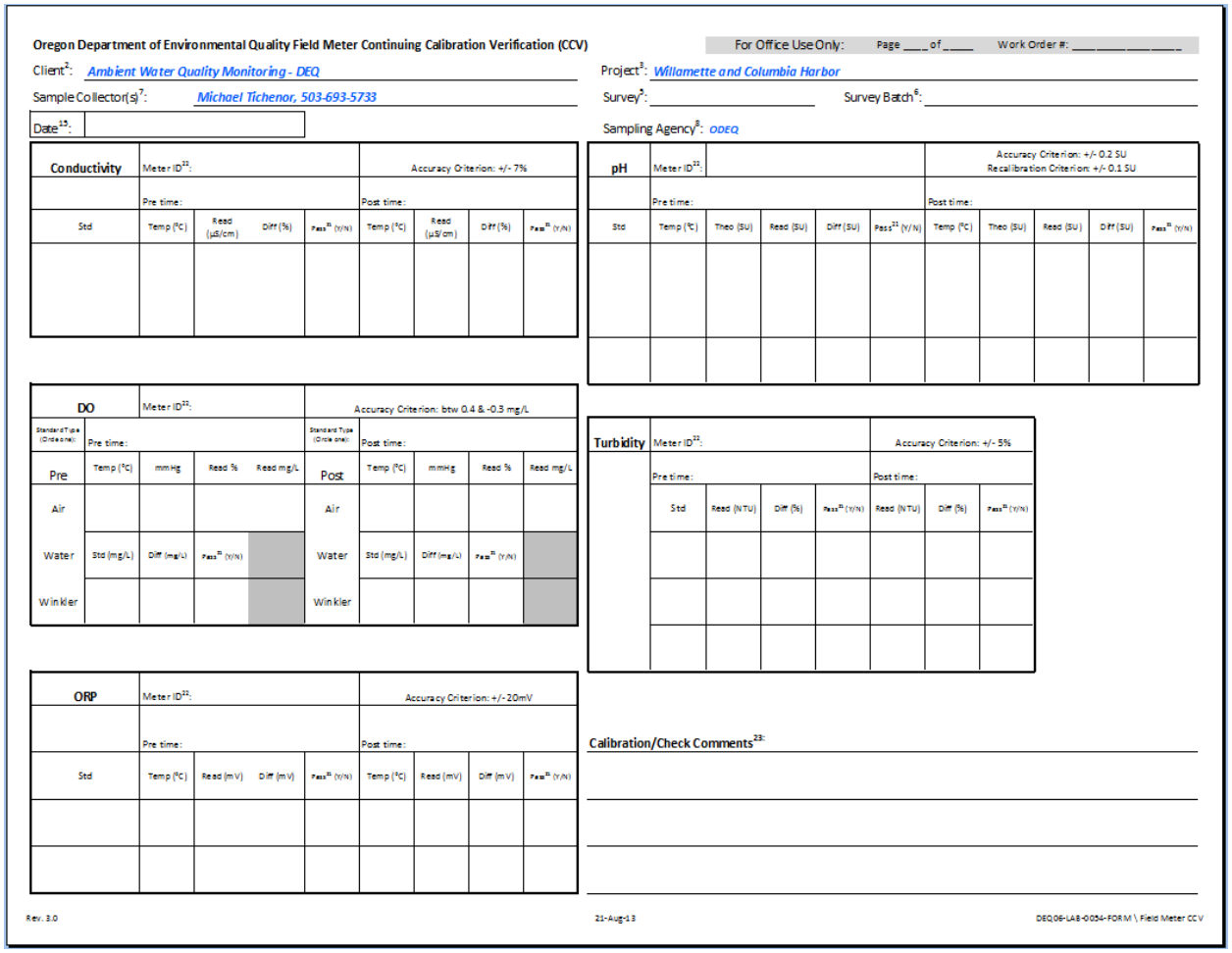
Field Meter Calibration Log



Oregon Department of Environmental Quality Field Meter Continuing Calibration Verification (CCV)

For Office Use Only: Page ___ of ____ Work Order #: _____

Client[2]: *Ambient Water Quality Monitoring - DEQ*

Project[3]: *Willamette and Columbia Harbor*

Sample Collector(s)[7]: *Michael Tichenor, 503-693-5733*

Survey[4]: _____ Survey Batch[6]: _____

Date[15]: _____

Sampling Agency[8]: *ODEQ*

Conductivity — Meter ID[22]: — Accuracy Criterion: +/- 7%

Pre time: — Post time:

Std	Temp (°C)	Read (µS/cm)	Diff (%)	Pass[21] (Y/N)	Temp (°C)	Read (µS/cm)	Diff (%)	Pass[21] (Y/N)

pH — Meter ID[22]: — Accuracy Criterion: +/- 0.2 SU; Recalibration Criterion: +/- 0.1 SU

Pre time: — Post time:

Std	Temp (°C)	Theo (SU)	Read (SU)	Diff (SU)	Pass[21] (Y/N)	Temp (°C)	Theo (SU)	Read (SU)	Diff (SU)	Pass[21] (Y/N)

DO — Meter ID[22]: — Accuracy Criterion: btw 0.4 & -0.3 mg/L

Standard Type (Circle one):	Pre time:				Standard Type (Circle one):	Post time:			
Pre	Temp (°C)	mmHg	Read %	Read mg/L	Post	Temp (°C)	mmHg	Read %	Read mg/L
Air					Air				
Water	Std (mg/L)	Diff (mg/L)	Pass[21] (Y/N)		Water	Std (mg/L)	Diff (mg/L)	Pass[21] (Y/N)	
Winkler					Winkler				

Turbidity — Meter ID[22]: — Accuracy Criterion: +/- 5%

Pre time: — Post time:

Std	Read (NTU)	Diff (%)	Pass[21] (Y/N)	Read (NTU)	Diff (%)	Pass[21] (Y/N)

ORP — Meter ID[22]: — Accuracy Criterion: +/- 20mV

Pre time: — Post time:

Std	Temp (°C)	Read (mV)	Diff (mV)	Pass[21] (Y/N)	Temp (°C)	Read (mV)	Diff (mV)	Pass[21] (Y/N)

Calibration/Check Comments[23]:

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