RECLAMATION
Managing Water in the West

TULE LAKE PESTICIDE MONITORING 2007

Quality Assurance Project Plan

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Klamath Basin Area Office
Water Quality Division

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Bureau of Reclamation
Mid-Pacific Region

TULE LAKE PESTICIDE MONITORING 2007

Quality Assurance Project Plan

_____	_____
Project Manager	Date
_____	_____
Quality Assurance and Data Project Manager	Date
_____	_____
Monitoring Team Project Manager	Date

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Project Management

I. Project/Task Organization

Reclamation's KBAO oversees the leasing of federal lands (Lease Lands) for agricultural activities within and in the vicinity of the Tule Lake National Wildlife Refuge (Figure 1).

The purpose of this pesticide monitoring program (Program) is to identify if pesticides are present in Tule Lake and provide information on the potential for pesticides applied within the Lease Lands to reach the waters of Tule Lake.

The objectives of the Program are to determine if pesticides are present in Tule Lake, determine if detected pesticides could have originated from the Lease Lands, and determine if pesticide concentrations in Tule Lake are at levels great enough to be harmful to ESA listed suckers.

Project management, data analysis, data management, and laboratory oversight are the responsibilities of the physical scientists in the KBAO Water Quality Division (Table 1). Field operations, quality assurance, and quality control are the responsibilities of the KBAO Water Quality Division field crew (Table 1). Chemical analysis of water samples and in house quality control and assurance procedures are the responsibility of the Pacific Agricultural Laboratory in Portland Oregon (Table 1).

Table 1. Project Responsibilities

Task	**Responsible Parties**
Project Manager	Jason Cameron
Data Analyst and QA/QC Managers	Damion Ciotti Jason Cameron
Monitoring Team Managers	Jessica Asbill
Maintenance and operation of field equipment	April Tower Gunter Schanzenbacher Matthew Kritzer Scott Miller
Sample transport and shipping	Matthew Kritzer Jessica Asbill
Sample analysis	Pacific Agricultural Laboratory
Review and validation of analytical data	Damion Ciotti
Writing and editing of reports	Jason Cameron

II. Problem Definition/Background

Tule Lake is located in north-central California and is the historic terminus of the Lost River watershed. Beginning in 1910, Tule Lake was dewatered and subsequently homesteaded between 1917 and 1949 for agricultural production (Reclamation 2000). To protect against flooding, areas at lower elevations were designated as sump areas and reserved for flood control. In addition to providing flood control, the sump areas also preserved some of the existing marsh habitat, which has been incorporated within the Klamath Basin's national wildlife refuges. Some of the marginal sump acreage subject to less frequent flooding was made available for leasing, but retained in federal ownership (Reclamation 2000). During 2007, the Bureau of Reclamation Klamath Basin Area Office (KBAO) administered lease contracts for crop production on approximately 16,170 acres of these lands, which are within Tule Lake National Wildlife Refuge.

KBAO is responsible for ensuring that farming practices within the Lease Lands, including herbicide, fungicide, and insecticide (pesticide) application, meet all applicable regulations. Proper pesticide application on the Lease Lands and private lands surrounding Tule Lake is of particular concern since two fish species reside in Tule Lake that are listed as endangered under the Endangered Species Act (ESA), the Lost River (*Deltistes luxatus*) and shortnose (*Chasmistes brevirostris*) suckers.

III. Project/Task Description

The objectives of the Program are to determine if pesticides are present in Tule Lake, determine if detected pesticides could have originated from the Lease Lands, and determine if pesticide concentrations in Tule Lake are at levels great enough to be harmful to ESA listed suckers. To accomplish these objectives, samples were collected from Tule Lake and analyzed for a suite of pesticides (and degradates). The selected analyses are for pesticides that are used on lands surrounding Tule Lake, known to persist in water, may be harmful to ESA listed suckers, and/or are of concern to management agencies. Reported pesticide concentrations are then compared with levels known to cause harm to fish to determine if pesticide concentrations within Tule Lake are great enough to be of concern for ESA listed suckers. Also, the dates of confirmed pesticide detections are compared to the dates and locations of pesticide application within the Lease Lands to determine if the pesticides could have originated from the Lease Lands. This program is not intended to pinpoint the origin of detected pesticides, rather to provide insight on the potential for pesticides used in the Lease Lands to reach the waters of Tule Lake.

General tasks for this project are as follows:

1. Collect surface water grab samples at four monitoring locations within the refuge (Table 2 and Figure 1).

2. Measure and record profiles of pH, conductivity, total dissolved solids, dissolved oxygen, water temperature, Secchi, algae, turbidity, and weather conditions at four monitoring locations.
3. Analyze for listed pesticides via contract laboratory.
4. Produce report summarizing findings.

Table 2. Sample Sites and locations.

Site ID	Location	UTM (Easting)	UTM (Northing)
TLDH	Tule Lake at the Donut Hole	621934.79	4638626.5
TLNW	Tule Lake at North West Corner	620841.24	4642902.3
TLEC	Tule Lake at English Channel	624730.94	4635614.4
LREW	Lost River at East-West Road	623912.47	4645717.1

IV. Data Quality Objectives for Measurement Data

Organic Constituents and External Quality Assurance Sample Acceptance Criteria

Appendix A summarizes the acceptance levels for the external check samples submitted to the laboratory with the production samples. All external check samples submitted to the laboratory are double-blind samples (sample is not identified as an external check sample). Part of the data assessment process may involve the reanalysis of external QA check samples for project parameters or the whole project for certain parameters if external QA check sample results are not confirmed upon reanalysis. The laboratory's Quality Control (QC) check samples must also meet similar levels of acceptability when analyzed with the production samples. The data assessment process also involves checking these laboratory QC check sample results to ensure they are within acceptable ranges.

Method Sensitivity

Where practicable, the reporting limit should be 3-5 times less than the action limit to ensure accuracy of low level results.

Completeness

A data completeness goal of 90 percent is the target for this project.

Representativeness

As much as is fiscally and logistically possible, sample sites are selected to maximize the representativeness of the samples.

Comparability

Comparability is achieved by collecting the samples in the same manner at the same sites over the life of the project. The laboratory will follow comparable method practices for the analysis of samples over the life of the project.

Historical Outliers

A result is considered to be an outlier if it is greater than three standard deviations from the average.

V. Special Training and Certificates

No special trainings or certifications are required for this project

VI. Documentaion and Records

Field Sheets

Field sheets are carried in the field and entries are made by field staff at the time of sample collection. Field sheet entries document the following information:

- Project name
- Site name or identification
- Sample collection date
- Sample collection start times
- Weather conditions
- Sample identifiers (IDs) and associated QA designations for QA samples
- Values obtained from field measurements
- Brief explanation of sampling methods
- Parameters and matrices collected
- Notes explaining any sampling irregularities
- Initials of field sampler (attesting that all data entered on the field sheet is accurate and complete)

After returning from the field, field sheets are stored in the central filing cabinet in the field crew office (Table 3).

Table 3. Document locations.

Document Age:	generated within the last month	generated within the last six months	generated more than three years ago, less than 10 years ago
Field Sheet	Field crew office	Field crew office	KBAO Vault
Instrument Calibration Sheet	Field crew office	Field crew office	KBAO Vault
Chain of Custody Sheet	Field crew office	Field crew office	KBAO Vault
Laboratory analytical report & case narrative	Data analyst and QA/QC manager's office	Data analyst and QA/QC manager's office	
Program-related correspondence	Project manager's office		Project manager's office
QA Reports	KBAO Water Quality Folder on the KBAO computer network		

Chain of Custody

Chain of Custody (COC) forms document the chain of legal custody of samples from the time samples are collected to the time they are delivered to the laboratory. Field personnel initiate COC documentation while in the field. COCs document the following information:

- Project name
- Project manager
- Title and signature of sample collector(s)
- Name of the designated analytical laboratory
- List of sample IDs
- Sample collection date
- Sample matrix type
- Number of containers per sample ID
- Analyses requested

- Point of contact phone number
- Date, time, and signatures of all parties responsible for receiving and relinquishing the samples from the time of collection to the time of delivery to the laboratory

Upon return from the field, COCs are filed in the central filing cabinet in the field crew office and KBAO personnel send the COCs to the laboratory with the samples. A copy of the COC is returned by the laboratory and filed in the central filing cabinet in the field crew office.

Data Assessment / Data Tables

The data analyst and QA/QC manager maintains a running data table for inclusion in water quality reports.

Data Generation and Acquisition

VII. Sampling Design

Four locations were sampled every two weeks during the pesticide application season, from April 2007 through October 2007. Three of the sampling sites are located within the lake and one located in the Lost River immediately upstream of Tule Lake. Table 2 lists the site locations and coordinates. See Figure 1 for a map of the sampling locations. The sampling locations were selected in close proximity to the Lease Lands, to target areas previously known to be utilized by suckers, to obtain sufficient spatial coverage of Tule Lake, and to identify possible pesticide inputs from the Lost River.

The Program is divided into two different elements:

- Grab Samples (Grab): Water quality grab samples are collected approximately every two weeks from April through October. Details on sample collection methodology can be found in the Sample Collection and Analysis section of this report. A full list of analyses, reporting limits, and quality assurance criteria can be found in Table A-1 and A-2 in Appendix A. Multi-probe profiles are obtained, as described below, when a grab sample is collected.

- Instantaneous Acquisition of Physical Parameters (Profile): Physical parameters were measured with multi-probe instrumentation when a grab sample is obtained. Parameters include temperature, dissolved oxygen, pH, and specific conductance. A full profile of the water column is sampled where measurements are obtained at 0.1m, 0.5m, 1.0m, and at one-meter intervals thereafter until the bottom is reached. The probes of the multi-parameter unit are approximately 0.1m above the sediment for the bottom reading. Air temperature, wind speed, wind direction, secchi disk depth, visual algal classification, and turbidity are also measured when a profile is acquired.

VIII. Sampling Methods

The "Klamath Basin Area Office Standard Operating Procedure for Water Quality Grab Sampling" (KBAOWQ SOP) (Appendix B) is utilized as the field sampling protocol.

All water samples are collected using the grab-sample method. A specially cleaned amber glass sample bottle is used to collect water just below the water surface. Samples collected by grab method in this manner should be pre-rinsed prior to sample collection. The KBAOWQ SOP instructs how the sampling is performed and explains associated procedures for documenting the field activities. Samples collected for pesticide analysis are sent to an approved laboratory using approved methodology (Table 4). A YSI 600XLM multi-probe unit is used to measure the physical parameters of the water. A portable Hach 2100-P turbidimeter is used to measure turbidity.

IX. Sample Handling and Custody Requirements

Water samples will be collected in specially cleaned amber glass bottles approved for pesticide sample collection and stored on ice. Samples collected in the field will be labeled with:

- sample identification
- constituent analyses required
- date and time sampled
- samplers initials

Upon collection in the field, water samples are placed in ice chests with a temperature at or below 4□C. All samples collected in the field require a COC and a field data sheet. The COC and the field data sheet will clearly document all the samples collected during that sampling period, associated sample identification numbers, and the date and time of collection for each sample. The pink (field) copy of the COC is removed and kept with the field records. The remaining copies of the COC are placed in the ice chest in a zip-lock plastic bag and will accompany the samples. A custody seal is attached across the opening of the ice chest by the field sampler. A commercial package carrier will transport the ice chests. An original copy of the COC sheet will be kept on file at the laboratory and the other copy returned to KBAO.

X. Analytical Method Requirements

Pacific Agricultural Laboratory (PAL) located in Portland, Oregon will perform laboratory analysis for all pesticide chemicals listed in Appendix A. The following methods are utilized to determine the concentrations of the constituents in the water samples.

Table 4. Analytical Methodologies Employed by Pacific Agricultural Laboratory

Analyses	Analytical Method
Chlorinated Acid Herbicides	EPA 8151A (GC-ECD)
Organochlorine Pesticides	Modified EPA 8081A (GC-FPD)
Organophosphorous and Organosulphur Pesticides	Modified EPA 8141A (GC-MS)
Organonitrogen Pesticides	Modified EPA 8270C (GC-MS)
Phenylurea Herbicides	EPA 8321A (HPLC-MS)
Carbamate Pesticides	EPA 8321A (HPLC-MS)
Table adapted from Pacific Agricultural Laboratory Services Catalog, 2006.	

XI. Sample Bottle Requirements

The samples are collected in specially cleaned amber glass bottles that are approved for pesticide sample collection and certified to be contaminate free. The required sample bottles and volumes are listed in Table 5 for each constituent. The bottles are not to be pre-rinsed prior to sampling. A waterproof-ink marker is used to write information about the sample on the bottle's label.

Table 5. Sample Bottles and Preservation Requirements

Analytes	**Container**	**Preservatives**	**Extraction Hold Time**	**Analysis Holding Time**
Chlorinated Acid Herbicides	*2-liter amber	4□C	7 days	40 days
Organochlorine Pesticides	*2-liter amber	4□C	7 days	40 days
Organophosphorous and Organosulphur Pesticides	*2-liter amber	4□C	7 days	40 days
Organonitrogen Pesticides	*2-liter amber	4□C	7days	40 days
Phenylurea Herbicides	*2-liter amber	4□C	7days	40 days
Carbamate Pesticides	*2-liter amber	4□C	7days	40 days
Miscellaneous Pesticides	*2-liter amber	4□C	7days	40 days

* Two 1-liter bottles are used per site for all pesticide groups.

XII. Quality Control Requirements

External Quality Assurance

To check laboratory accuracy, precision, and contamination, field personnel will incorporate one blank sample and one duplicate sample per sampling event. Field samplers will label these external QA check samples with identifications similar to production samples so they can pass as double blind samples. The QA officer ensures that field personnel properly prepare external QA check samples. The laboratory will incorporate their own QA check samples, including spikes, duplicates and blanks, to ensure data reliability. KBAO will evaluate QA samples using the following methodology:

Accuracy: Matrix spike samples will be completed by PAL to evaluate the accuracy of analytical methodology. Accuracy check samples will be analyzed at a rate of 10%. Percent recovery will be used to evaluate accuracy as follows:

Percent Recovery = ((observed conc.-sample conc.)/(true spike conc.)) x 100

Precision: Duplicate samples are incorporated to assess precision. Duplicates for this project will be completed at a rate of 100%. Precision is assessed using relative percent difference (RPD):

For replicate results X1 and X2:
RPD = ((X1-X2)/(X1+X2/2)) x 100

Contamination: Inorganic water blank samples are incorporated to assess laboratory contamination. They are incorporated at a rate of 1 per sampling event or at a minimum of 5 percent of the production samples.

Laboratory Quality Control Samples

The laboratory incorporates QC samples at the frequency specified in the laboratory Standard Operating Procedure (SOP) and/or analytical method. Results for the QC samples are assessed based on the acceptance criteria in the analytical method and the laboratory SOP. If any laboratory QC samples do not meet the established acceptance criteria, the laboratory follows the corrective action protocol detailed in the analytical methods and/or laboratory SOP.

Holding Times

The date of the sample processing/analysis is compared to the date the sample was collected to ensure the sample was processed and analyzed within the holding time. If the holding times are exceeded, the program manager determines if re-sampling is required. If re-sampling is not required, the QA specialist qualifies the data as necessary.

XIII. Instrument/Equipment Testing, Calibration, Inspection, and Maintenance

The laboratory performs instrument calibrations following the procedures and frequencies stated in the analytical methods for each parameter.

The multi-probe instrument is calibrated before it is used in the field. The calibrations will follow the KBAO Multi-Probe Calibration Protocol. Field personnel record multi-probe calibrations on calibration sheets, which are filed at KBAO. The Hach 2100-P turbidimeter is calibrated according to manufacturer specifications. Field personnel record turbidimeter calibrations on calibration sheets, which are filed at KBAO.

XIII. Inspection/Acceptance for Supplies and Consumables

Certified clean bottles for sample collection are ordered from outside vendors. All bottles are inspected prior to use. If any damage or contamination is suspected, packages are not accepted.

XIV. Data Management

Responsible personnel enter field measurements and laboratory data into the Environmental Monitoring Database. QA personnel enter QA-specific data into Microsoft Excel tables and generate QA summary reports. Prior to releasing data or reports, data entries are secondarily reviewed.

Assessment and Oversight

XV. Assessments and Response Actions

Audits

Not Applicable to this project.

Field
Not Applicable to this project.

XVI. Reports to Management

Not Applicable to this project.

Data Validation and Usability

XVIII. Data Review, Validation and Verification Requirements

KBAO will review and verify all data generated from this program. KBAO will follow Reclamation's Mid Pacific Region protocol outlined in their QA SOP to review and verify the data from this program.

The laboratory's QC check samples must meet certain levels of acceptability when analyzed with the production samples. These levels of acceptability are established through the use of control charts or set at certain limits found in the methods. Part of the data verification process involves checking these laboratory QC check sample results to ensure they are within acceptable ranges. If a laboratory QC check sample fails to demonstrate an acceptable result, the anomaly must be explained with a footnote or included in the case narrative section of the data report. In order to ensure data quality, QA personnel will assess laboratory data packages to determine if all samples were analyzed within the holding times.

XIX. Verification and Validation Methods

When KBAO incorporates external QA check samples into a batch of production samples submitted to a laboratory, the laboratory must meet certain standards of acceptance on these QA check samples for the data to be approved as reliable. For this project, the standards of acceptability for the external QA check samples are:

Duplicates:	For values > 5X Reporting Limit, %RPD $\leq$ 20% For values $\leq$ 5X Reporting Limit, values may vary $\pm$ Reporting Limit
Blanks:	Blank concentration should be less than 10% of lowest sample concentration or less than two times the reporting limit.

Reclamation uses the following equations to validate data:

Relative percent difference: A statistic for evaluating the precision of a replicate set. For replicate results X1 and X2:

$$RPD = ((X1-X2)/(X1+X2/2)) \times 100$$

Completeness: The amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal operations. It is usually expressed as a percentage:

$$\% \text{ completeness} = V/n \times 100$$

where: V= number of measurements judged valid
n = total number of measurements

Percent recovery: A measure of accuracy determined from comparison of a reported spike value to its true spike concentration:

% Rec. = ((observed conc.-sample conc.)/(true spike conc.)) x 100

Accuracy: Accuracy is a measure of the bias inherent in a system or the degree of agreement of a measurement with an accepted reference or true value. It is most frequently expressed as percent recovery.

Precision: A measurement of mutual agreement (or variability) among individual measurements of the same property, usually under prescribed similar conditions. Precision is usually expressed in terms of relative percent difference, but can be expressed in terms of range.

Range: The difference between the largest and smallest numbers in a set of numbers.

All data entered into tables by KBAO are subjected to a thorough secondary review before being released to clients.

XX. Reconciliation with Data Quality Objectives (DQO)

After each sampling event, calculations and determinations for precision, completeness and accuracy will be made immediately and corrective actions 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 failure will be evaluated. If the cause is due to equipment failure, calibration/maintenance techniques will be reassessed and improved. If the problem is determined to be a sampling error, team members will be retrained. If the problem is laboratory

related, the laboratory program manager will be contacted and corrective actions implemented. Any limitations on data use will be detailed in both interim and final reports and other documentation as needed.

This QAPP will be revised if DQO failure occurs while following protocol. Revisions will be submitted to the review team, including the quality assurance group and technical advisors for approval.

Figures

Figure 1. Map of Tule Lake and Lost River Sampling Locations

Appendix A

Table A-1. Analytes and Data Quality Objectives for Targeted List Compounds

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Chlorinated Acid Herbicides				
2,4-D	0.20	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dicamba	0.080	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
MCPA	20	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Organochlorine (Halogenated) Pesticides				
Chlorothalonil	0.060	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Oxyfluorfen	0.060	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pendimethalin	0.060	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Permethrin	0.60	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Organophosphorous and Organosulfur Pesticides				
Chlorpyrifos	0.060	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Disulfoton	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Malaoxon	0.30	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Malathion	0.30	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Organonitrogen Pesticides				
Azoxystrobin	0.030	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenoxaprop-ethyl	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Imidacloprid	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Metalaxyl-M	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Metribuzin	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Simazine	0.60	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Phenylurea Herbicides				
DCPMU (Diuron degradate)	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Diuron	0.030	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Carbamate Pesticides				
Oxamyl	0.030	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Table A-2. Analytes and Data Quality Objectives for Multi-residue Screen Compounds

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Organochlorine (Halogenated) Pesticides				
Acetachlor	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Alachlor	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Aldrin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Benfluralin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Bifenthrin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
α-BHC	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
β-BHC	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
δ-BHC	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
γ-BHC	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Captafol	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Captan	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlordane	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chloroneb	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlorobenzilate	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlorothalonil	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Cyfluthrin	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Cyhalothrin	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Cypermethrin	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dacthal	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
p,p'-DDD	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
p,p'-DDE	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
p,p'-DDT	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Deltamethrin	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dicloran	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dieldrin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Endosulfan I	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Endosulfan II	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Endosulfan Sulfate	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Endrin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Endrin aldehyde	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Esfenvalerate	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Ethalfluralin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenarimol	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenvalerate	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Flutolanil	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Folpet	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Heptachlor	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Heptachlor epoxide	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Hexachlorobenzene	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Iprodione	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Kelthane	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Metolachlor	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Methoxychlor	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Mirex	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Norflurazon	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Ovex	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Oxyfluorfen	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
PCA	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
PCNB	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pendimethalin	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Permethrin	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Prodiamine	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pronamide	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propachlor	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propanil	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propiconazole	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pyrethrins	1.2	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Terbacil	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Toxaphene	6.0	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Trifloxystrobin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Triflumazole	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Trifluralin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Vinclozalin	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Organophosphorous and Organosulfur Pesticides				

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Aspon	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Azinphos-methyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Bolstar	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Carbofenothion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlorfenvinphos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlorpyrifos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Chlorpyrifos-methyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Coumaphos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Demeton-O	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Demeton-S	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Diazinon	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dichlorfenthion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dichlorvos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dicrotophos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dimethoate	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Disulfoton	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
EPN	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Ethion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Ethoprop	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Famphur	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenitrothion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fensulfothion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenthion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Malathion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Methidathion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Mevinphos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Monocrotophos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Parathion	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Parathion-methyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Primiphos-methyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Phorate	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Phosphamidon	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Phosmet	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propargite	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Tetrachlorvinphos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Terbufos	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Trichlorfon	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Organonitrogen Pesticides				
Amitraz	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Ametryn	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Atazine	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Azoxystrobin	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Bromacil	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Bromopropylate	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Carfentrazone-ethyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Cyanazine	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Diclofop-methyl	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Dimethenamid	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Ethofumesate	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenoxaprop-ethyl	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenbuconazole	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenhexamid	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fipronil	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fluazifop-P-butyl	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fludioxanil	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Flumioxazin	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fluometuron	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fluoxypyr-meptyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Hexazione	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Imidacloprid	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Isoxaben	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Mefenoxam	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Metalaxyl	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Metribuzin	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Myclobutanil	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Oryzalin	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pirimicarb	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Prometon	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Prometryn	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propazine	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pyraclostrobin	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Pyridaben	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Sethoxydim	6.0	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Simazine	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Simetryn	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Sulfentrazone	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Tebuconazole	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Tebuthiuron	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Thiabendazole	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Triadimefon	0.60	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Phenylurea Herbicides				
Chlorpropham	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Diuron	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
DCPMU (Diuron degradate)	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenuron	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Linuron	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Monuron	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Neburon	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propham	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Siduron	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Carbamate Pesticides				
Aldicarb	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Aldicarb sulfone	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Aldicarb sulfoxide	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Bendiocarb	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Carbaryl	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

Parameters	Reporting Limit, µg/L	Precision (Duplicate, % RPD)	Contamination (Blank)	Corrective Actions
Carbofuran	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Fenobucarb	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
3-Hydroxycarbofuran	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Methiocarb	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Methomyl	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Oxamyl	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Propoxur	0.12	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample
Thiobencarb	0.30	[>5x RL] = 0%-20%, [≤ 5x RL] difference within ± RL	<2RL or <0.1 x [lowest sample]	Re-analyze sample

RL = Reporting Limit [ ] = If concentration of determination is...

Appendix B

KBAO Standard Operating Procedure for Multi-Probe Field Measurements

Required Equipment and Supplies

- Field datasheets
- Clipboard
- List of multi-probes to retrieve
- Sharpie pens
- Rite in the Rain pens
- Multi-probe profile unit
- 2 YSI field cables
- 2 YSI 650 MDS handheld units
- Multi-probes for deployment in a protective carrying case
- Bucket for side-by-side test
- Spare batteries - AA and C cell
- Tools to replace batteries
- Turbidity water sampler
- Turbidity meter
- Secchi disk
- Thermometer/Anemometer
- Keys
- Waders
- Leather and/or rubber gloves

Multi-Probe Profile and Site Field Data Collection

A multi-probe profile of the water column is obtained during a site visit or whenever a multi-probe is deployed or retrieved for continuous data acquisition. Air temperature, wind speed and direction, secchi disk depth, visual algal classification and turbidity are measured when a multi-probe profile is acquired. All data is recorded on the Klamath Basin Area Office (KBAO) Water Quality Profile Field Datasheets using permanent black ink with either "Sharpie ultra fine tip" or "Rite in the Rain" pens. Refer to Table 1 for the significant digits recorded and examples.

- Assemble the multi-probe profile unit upon arrival to the sampling site. Remove the storage cup from the multi-probe profile unit. **Gently** place the sensor guard onto the multi-probe unit and hand tighten **(DO NOT over tighten).** Be aware of the probes when putting the sensor guard on the multi-probe unit, as they are very fragile and can break from a light impact with the sensor guard.

- Place the multi-probe profile unit in the water body to be measured to begin the stabilization period. Use good judgment and **be aware of potential hazards** when placing the multi-probe into the water. Always obtain multi-probe profiles **downstream of bridge** structures, as the multi-probe may become entangled or impact the pilings under the bridge and cause damage to the unit. Use caution when sampling upstream of a dam or check structure, as the multi-probe can be pulled through the structure and severely damaged. The multi-probe profile unit should be set-up to **stabilize for 120 seconds** and no measurements should be obtained during this stabilization time.

- Place the field thermometer/anemometer in a **shaded location** while the multi-probe is stabilizing. The field thermometer must be exposed to the air at the sampling location for approximately 10 to 15 minutes to get an accurate temperature measurement. Leave the thermometer in the shaded location until the multi-probe profile has been completed and all other field data has been collected. Take the air temperature and wind speed measurements last, immediately prior to leaving the sampling location. This allows adequate time to get an accurate temperature measurement by allowing the thermometer to equilibrate with the air. Air temperature is recorded in centigrade and wind speed is recorded in miles per hour. If wind is less than 5 mph spin thermometer in a circle to cool it off and then take the temperature. Record the air temperature to the nearest five tenths of a degree and the wind speed to the nearest whole number.

- Using the turbidity water sampler, collect sample water from a depth of one-meter when possible. If the depth at the sampling site is too shallow to collect the sample water at one-meter, use good judgment and select an appropriate sampling depth. **Do not collect surface debris or bottom sediment in the sample.** Discard sample water and resample if surface debris or sediment is observed in the turbidity sample water. Ensure the orange filling cap is installed on the turbidity water sampler. The filling cap ensures the sampler fills at the desired depth of one-meter. Thoroughly rinse the turbidity sampler three times with sample water prior to filling. Remove the caps from three turbidity vials and discard the sample water from the previous sampling site. **Do not touch the glass surface** of the turbidity vials. Use a latex glove or the turbidity vial wiping cloth to grasp the turbidity vial and unscrew the cap. Invert the sampler to ensure the sample is uniform. Thoroughly rinse the turbidity vials three times with sample water. Invert the sampler prior to filling each vial to maintain a well mixed sample. Fill three turbidity vials to approximately 1/4" from the top. **Do not fill the vials to the very top,** as the water may leak into the turbidimeter and cause damage to the unit. Use the turbidity vial wiping cloth to wipe all water and/or debris from the outside of the vials. Ensure the vials are clean and free of streaks or scratches. If the vial is scratched, discard and use a new vial. Place a vial into the turbidimeter with the white triangle marking oriented towards the front of the meter. Ensure the turbidimeter is in the "auto-range" operating mode. Close the lid then press the read button. Record the turbidity measurement on the field datasheet exactly as displayed by the turbididmeter. Repeat for the remaining two vials.

The turbidity vials may require reanalysis if the obtained measurements are not reasonably comparable with the other turbidity measurements. **All three measurements should be within 10% of the average** of the measurements. In some instances, all of the measurements may not be within 10% of the average when there is excessive particulate material present in the sample water.

- Obtain a secchi measurement in a shaded location. Note on the field datasheet if no shade is available and the secchi measurement is obtained in direct sunlight. Lower the secchi disk into the water until it is no longer visible. Slowly raise the secchi disk until the black and white pattern is clearly visible. Record the secchi measurement to the nearest 5 hundredths of a meter (ex. 1.25 meters or 1.20 meters). Sunglasses should be removed prior to obtaining the secchi measurement.

- Obtain a visual algal classification in a representative location. Survey all of the water around the sampling site and ensure that any variation of algal density is taken into consideration. Obtain the visual algal density measurement when making the secchi measurement. The visual algal classification system ranges from zero to five and is measured as follows;

0 - Not Present: No algae is visible in the water column
1 - Scant: Present, less than 25% coverage of the white portions of the secchi disk
2 - Light: Approximately 25% coverage of the white portions of the secchi disk
3 - Moderate: Approximately 50% coverage of the white portions of the secchi disk
4 - Heavy: Approximately 75% coverage of the white portions of the secchi disk
5 - Dense: Approximately 100% coverage of the white portions of the secchi disk

- Multi-probe measurements are obtained at 0.1 m, 0.5 m, 1.0 m and at one-meter intervals thereafter until the bottom is reached. The probes of the multi-probe unit should be approximately 0.1 m above the sediment for the bottom reading. In windy conditions where large waves exist, the 0.1 m measurement may be omitted, as the probes will not be in continuous contact with the water. In this case the first measurement will be at the 0.5 m depth. **Allow at least one minute for the probes to stabilize** at each depth prior to recording the measurement. Log all measurements to the handheld unit. Record values as displayed on the handheld unit except for depth, where measurements are recorded to the nearest tenth of a meter.

Table 1. Proper field data documentation

Measurement	Recorded Value	Example
Air Temperature	Round to nearest 0.5°C	18.2 = 18.0 and 18.3 = 18.5
Wind Speed	Round to nearest whole #	3.4 = 3 and 3.5 = 4
Multi-Probe Data	Displayed values	9.46 = 9.46
Secchi Measurement	Round to nearest 0.05 m	0.42 = 0.40 and 0.43 = 0.45
Turbidity	Displayed values	9.53 = 9.53 and 10.6 = 10.6 and 103 = 103
Algal Classification	Whole #	0, 1, 2, 3, 4 or 5

Side-By-Side Test Procedure

- Perform the side-by-side test procedure prior to deploying a multi-probe. Attach the multi-probe profile unit and site deployment multi-probe to the handheld units. Remove the storage cups and place sensor guards on the units. Place both multi-probes into the bucket of fresh tap water. Record the multi-probe and handheld unit serial numbers on the datasheet marked **"Deployment."** Fill in all required fields. Turn both handhelds on at **exactly the same time**. Press enter in the run menu. Ensure the handheld units and multi-probes are both synchronized and are counting down the 120 second stabilization period. When the multi-probes start reading, push the enter button **at the same time** to enter into the logging menu. Find or enter the site name in the site name menu. Press enter to have the multi-probes record the displayed data. Exit out to the main menu and enter into the file menu. Go to view file. Select the file name. Scan down to the last recorded value. Transcribe the values onto the datasheet under the heading "In Bucket." Don't forget to record the bucket start time from the file. **Exit out of all menus and turn off the handheld units.**

- Detach the site deployment multi-probe from the field cable and replace the connector cap. The multi-probe is now ready for deployment.

- **Perform the above multi-probe profile and site field data collection**

Multi-Probe Deployment

- Using rubber or leather gloves, pull up the chain and protective housing attached to the buoy. The multi-probe will be locked inside of a protective multi-probe housing. Place the protective housing securely in the boat. Carefully remove the lock and protective housing securing pin. Place the lock and securing pin on the floor of the boat so they aren't accidentally knocked into the water. Remove the protective housing lid and place the site deployment multi-probe in the housing. Replace the protective housing lid, pin and lock. Gently place the protective housing and multi-probe in the water. Record the deployment time on the "Deployment" field sheet. **Remember, some sites have a**

surface and bottom multi-probe. You need to deploy both multi-probes at these sites.

Multi-Probe Retrieval

- **Do not pull up the buoy and multi-probe within fifteen minutes before the hour to five minutes after the hour.** Using rubber or leather gloves, pull up the chain and protective housing attached to the buoy. Place the protective housing securely in the boat. Remove the lock and protective housing securing pin. Place the lock and securing pin on the floor of the boat so they aren't accidentally knocked into the water. Remove the protective housing lid and remove the multi-probe from the protective housing. Wash the outside of the multi-probe with lake/river water by hand. Place a storage cup with water on the retrieved multi-probe. Record the retrieved multi-probe serial number on the "Retrieved" field sheet. Replace the protective housing lid, pin and lock. Gently place the protective housing in the water. Place the retrieved multi-probe into the protective carrying case. **Remember, some sites have a surface and bottom multi-probe. You need to retrieve both multi-probes at these sites.**

- **Perform the above multi-probe profile and site field data collection**