Clark County
Volunteer Monitoring Program
Lacamas Lake Monitoring

Quality Assurance Project Plan

Version 2.0   April 2007

Project Name:	Lacamas Lake Monitoring
Project Code:	Lacamas
Agency Name:	Clark County Washington
Agency Contact Name:	Jason Wolf / Jeff Schnabel
Department:	Public Works Water Resources
Funding Source:	Clark County Clean Water Fee

Approvals:

Supervisor:	______________________________ Rod Swanson, Senior Planner Clark County Public Works Water Resources	Date: __________
Project Manager and Volunteer Coordinator	______________________________ Jason Wolf, Natural Resource Specialist I Clark County Public Works Water Resources Contact: 360-397-6118 x4282 jason.wolf@clark.wa.gov	Date: __________
QA Review and technical support	______________________________ Jeff Schnabel, Natural Resource Specialist III Clark County Public Works Water Resources	Date: __________

Prepared by: Jeff Schnabel, Clark County Public Works Water Resources

Purpose of the Quality Assurance Project Plan

Clark County Public Works Water Resources (Water Resources) follows the general Quality Assurance Project Plan (QAPP) format defined by the State of Washington Department of Ecology (Ecology) (Lombard and Kirchmer, 2001). Water Resources requires a QAPP for each monitoring project. The plan addresses project design, schedule, methods of data collection and management, quality assurance and quality control requirements, data analysis, and reporting.

Background and Problem Statement

Historical Information

Lacamas Lake and Round Lake are located in Clark County, Washington, on the northern boundary of the city of Camas. In a county with few lakes, Lacamas and Round Lakes are recognized as an important recreational resource. Fishermen, swimmers, boaters, and hikers utilize the lakes and their shores year-round.

Periodic water quality monitoring by the Southwest Washington Health District (SWHD) from 1974-1980 first raised concerns about water quality in Lacamas Lake and its tributary streams. In 1983, the Clark County Intergovernmental Resource Center (IRC) received a grant from the Washington Department of Ecology (Ecology) to fund a Phase I Diagnostic and Restoration Analysis (SRI, 1985).

Based on this investigation, Lacamas and Round Lake were categorized as "eutrophic". The terms oligotrophic, mesotrophic, and eutrophic are often used to characterize lakes according to a low, medium, or high level of algae production, respectively. Over time, lakes naturally move slowly along this continuum in a direction toward eutrophic conditions (high algal production). In some cases, however, this movement can be dramatically accelerated due to human activities in a lake or watershed.

It should be noted that trophic categories are not meant to convey value judgments. Oligotrophic conditions do not necessarily imply "good" water quality or a "healthy" lake. Conversely, eutrophic conditions do not always mean a lake is impaired or has "bad" water quality. Rather, trophic categories describe the amount of nutrient enrichment and biological productivity in a lake, whereas terms like "healthy" and "impaired" refer to the condition of a lake relative to its desired uses or natural condition (Snohomish County, 2003).

In the case of Lacamas Lake, accelerated eutrophication has dramatically altered the lake from its natural historical condition and resulted in conditions that may impair current desired uses such as fishing, swimming, and aesthetic enjoyment.

Water quality problems associated with Lacamas Lake eutrophication in 1984 included severe dissolved oxygen depletion, poor water clarity, high levels of algae growth, nuisance blue-green algae blooms, and dense beds of aquatic macrophytes. These conditions are typical of a highly eutrophic lake, and were attributed primarily to excessive inputs of the nutrient phosphorus due to human activities in the Lacamas watershed.

Subsequently, the Lacamas Lake Restoration Program (LLRP), supported in part by grants from the Centennial Clean Water Fund and Section 319 Fund, implemented a program of agricultural Best Management Practice (BMP) installation, water quality monitoring, and public education in the watershed between 1987 and 2001. Those efforts were aimed at reducing the amount of phosphorus in Lacamas Lake and are summarized in the Lacamas Lake Restoration Program Final Report (Hutton, 2002), Lacamas Lake Restoration Program: WY2000 and WY 2001 Water

Quality Monitoring (Schnabel, 2002), and the Lacamas Lake Watershed Restoration Project Program Review (E&S, 1998). These reports and others relating to Lacamas Lake are available from Clark County Water Resources.

The LLRP was successful in reducing the number of agricultural sources of phosphorus to the lake, establishing a greater scientific understanding of its water quality and dynamics, and raising awareness among the citizens of Clark County. However, despite the fact that annual loading and in-lake concentrations of phosphorus declined, the lake continued to exhibit the signs of eutrophication observed in the early 1980s. Shifting land-use patterns have resulted in accelerated encroachment of residential, commercial, and recreational development into the watershed. These changes present a continuing challenge to the protection and maintenance of desired beneficial uses in Lacamas and Round Lakes.

Clark County Clean Water Program

Since the expiration of the Lacamas grant in December 2001, Clark County Water Resources has continued ambient monitoring activities in Lacamas Creek and Lacamas Lake under its NPDES Clean Water Program. The Clean Water Program was initiated in 2000 to increase protection for our streams, lakes, and groundwater through stormwater management. The program began in response to the increasing need for stewardship of local resources, as well as federal and state mandates for local government agencies to better control and clean stormwater runoff. The Clean Water Fee, which is paid by property owners in unincorporated Clark County, supports the enhanced levels of service required to accomplish Clean Water Program goals.

The Clean Water Program is committed to building and implementing a comprehensive monitoring program that supports efforts to:

- Identify water quality problems and their sources
- Document existing health of our lakes and streams and track long-term changes
- Plan appropriate projects to improve water quality
- Demonstrate compliance with the county's National Pollutant Discharge Elimination System (NPDES) permit for the stormwater system

In the absence of a coordinated lake management and monitoring approach by other local and state jurisdictions, Water Resources continues ambient monitoring of this resource to enhance future lake management decisions and improve the evaluation of potential changes in lake health. Data summaries for the period 2003-2006 may be found on the Water Resources web page at: http://www.clark.wa.gov/water-resources/documents.html#strmac

QAPP revision

This document replaces the Clark County NPDES Lacamas Lake Monitoring QAPP (Version 1.0) which was implemented in 2004. Beginning in 2007, Lacamas Lake Monitoring activities are being implemented as a volunteer project through the Water Resources Volunteer Monitoring Program. Changes in scope, project management, and protocols under the volunteer program necessitate this revision of the QAPP. Clark County Volunteer Monitoring Program Lacamas Lake Monitoring QAPP (Version 2.0) applies to monitoring activities beginning in May 2007.

Organization and Timeline

Project Staff

Lacamas Lake monitoring activities are administered through Clark County Public Works Water Resources as part of the county's NPDES Clean Water Program.

Client:	Earl Rowell, Water Resources manager
Supervisor:	Rod Swanson, Senior Planner
Project Manager:	Jason Wolf, Natural Resources Specialist I
QA Review:	Jeff Schnabel, Natural Resources Specialist III
Technical Oversight:	Jeff Schnabel

Rod Swanson, Senior Planner, coordinates monitoring activities within the NPDES permit program and between the program and other agencies, and directs lead/support staff.

Jason Wolf, Natural Resources Specialist I, is the project manager, primarily responsible for project implementation, data analysis, and writing the annual data summary. Jason is also the volunteer coordinator and is responsible for recruiting and managing the activities of volunteers, and maintaining and lending equipment to volunteers.

Jeff Schnabel, Natural Resources Specialist III, provides quality assurance review and technical assistance in regards to data analysis and report writing.

Trained volunteers carry out scheduled field activities, including collecting samples, and recording field measurements and observations. The volunteers document field activities on datasheets and forms, and submit samples to Water Resources for lab analysis.

Laboratory Contracts

Water quality samples are analyzed by Addy Lab, a Washington Department of Ecology (Ecology) accredited laboratory located in Vancouver Washington. Chlorophyll-a, total Kjeldahl nitrogen, and total phosphorus analyses are performed by Columbia Analytical Laboratories as a sub-contractor to Addy Lab. Phytoplankton analyses are performed by Aquatic Analysts, a qualified laboratory located in White Salmon, Washington. Contact information is located below.

Tom Newman
Addy Lab
2517 E. Evergreen Blvd
360-750-0055

Jim Sweet
Aquatic Analysts
White Salmon, WA 98672
509-493-8222

Laboratory contracts may change as project needs evolve.

Budget
Budget estimates for the project are found in Table 1:

Table 1: Lacamas Monitoring Project annual budget estimate

Budget Category	Estimated Cost (annual)
Volunteer coordination	$2000.00
Field staff	$2000.00
Vehicle	$200.00
Laboratory	$2500.00
Sample shipping	$200.00
Equipment maintenance	$500.00
Data management	$1500.00
Reporting	$1500.00
Contingency	$3000.00
Total	**$13,400.00**

Project Timeline
This is an ongoing ambient monitoring project, intended to provide data over an extended time period. The project is designed to collect data at a temporal scale appropriate for long-term trend analysis as well as short-term assessment of lake condition. This QAPP (Version 2.0) and future addendums apply to all monitoring under the Lacamas project beginning in May 2007.

Project Description

Goals and Decision Statement
Lacamas project data are used to assess current lake health and define long-term trends in lake condition. Criteria for these determinations include 1) comparison of physicochemical data to water quality standards and aquatic life criteria; 2) calculation of trophic state indices; 3) calculation of statistical trends based on the long-term dataset; and 4) comparison of lake characteristics to historical data and regional expectations.

Objectives
The primary objectives of the Lacamas Lake Monitoring Project are to:

- Assess overall lake health in terms of beneficial use support and water quality criteria
- Identify and describe trends in lake trophic status using nutrient and algal indicators
- Disseminate accurate information to local and state agencies, the general public, and other stakeholders

Sampling Design

Stations
Figure 1 shows the location of the lake station utilized for routine Lacamas ambient monitoring. Station LACL11 is located over the deepest part of Lacamas Lake, and corresponds to the location of ambient water quality monitoring in most previous Lacamas Lake studies.

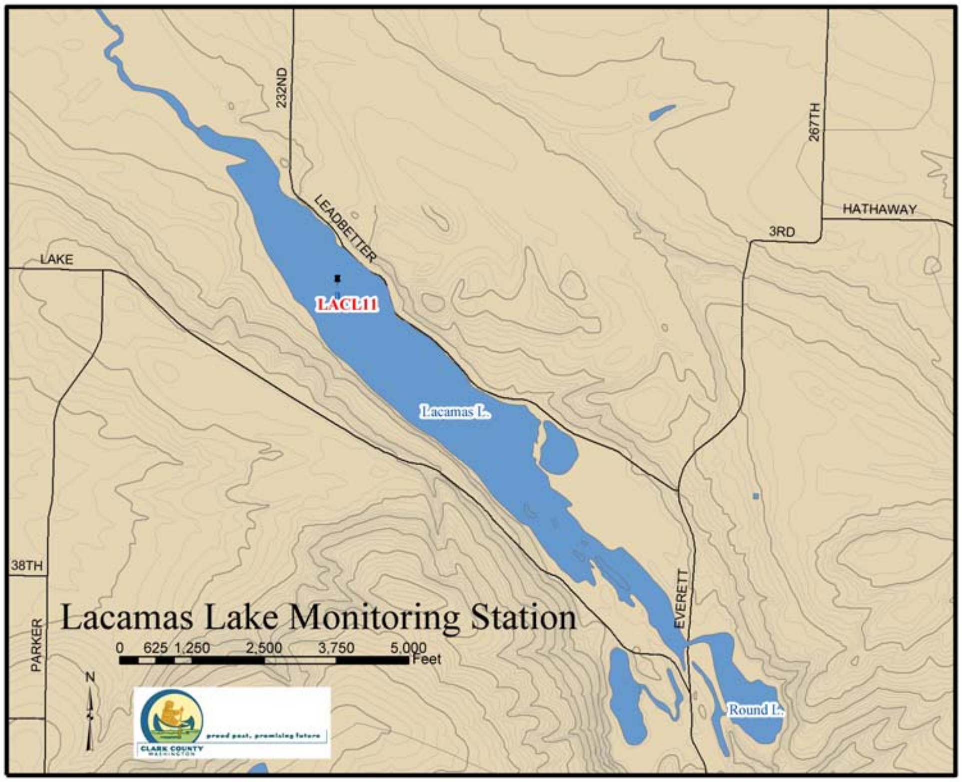

Figure 1. Location of Lacamas Lake monitoring station.

Schedule of activities
Samples, measurements, and observations are collected at station LACL11 on a monthly basis from May through October (summer season). Samples are submitted by volunteers to county staff and the contracted laboratory according to the requirements prescribed by specific characteristic methodologies. This information is detailed in the Field Procedures and Laboratory Procedures sections of this document.

Schedule Limitations
This is a volunteer monitoring project and deviations from a planned schedule are to be expected. Factors such as inclement weather may affect the timing of field activities. Volunteers are instructed to determine specific dates for field activities depending on the team members' schedules. As a result, the timing of field activities may be affected by volunteer availability. Equipment is borrowed from Water Resources to perform field activities and is also subject to availability. Volunteers are encouraged to plan in advance and reserve equipment for the dates that suit their team's needs.

Representativeness
Project data are intended to be representative of lake conditions at the time of sample collection. Water Resources staff has trained volunteers on standard monitoring procedures to collect representative samples. Sampling at a consistent location and utilizing standard procedures facilitate the collection of representative samples and measurements.

In most cases sampling is performed at approximately the same time during each trip to minimize diurnal effects on characteristics which show large diurnal variations (temperature, pH, dissolved oxygen, chlorophyll-*a*, water clarity). However, collection times will vary with volunteer availability and schedules.

Data comparability
Project data are compared to data collected during previous Lacamas Lake studies and combined with the existing long-term dataset for trend analyses. Data are also intended to be comparable to other local and regional lake studies. Long-term comparability of Lacamas data with other data is facilitated by utilizing and documenting standard procedures for data collection and analyses.

In volunteer monitoring, projects must balance 1) monitoring and data requirements on a regional scale; 2) the level of sophistication and effort associated with professionally collected data; and 3) techniques volunteers can utilize with a high likelihood of success. Utilizing comparable protocols and techniques that are less intense than more rigorous investigations, volunteers are capable of successfully collecting a number of types of data. Specifying standard procedures for data collection and analyses facilitates the long-term comparability of volunteer-collected data. Furthermore, following examples of established volunteer monitoring procedures, developed in consultation with experts, guards against generating data that will be irrelevant to natural resource managers or the public.

Any long-term monitoring program is likely to experience changes in sampling or analytical procedures that can potentially affect results or data analysis. Normally, changes will result in improved precision or reduced bias, but even improvements in procedures can cause difficulty in the analysis of long-term trends (Hallock, 2003). Issues of this type are likely to occur in the Lacamas project and will be addressed as part of ongoing data analysis.

Quality Objectives

Field and Lab
Analytical methods, detection or precision limits, and Measurement Quality Objectives (MQOs) for accuracy, precision, and bias are listed in Table 2. MQOs for the project are set at generally accepted targets for ambient water quality monitoring projects utilizing volunteers. Data quality objectives and quality control procedures for laboratory characteristics are detailed in the lab's quality assurance documents maintained and stored at their facility.

Collection, preservation, transportation, and storage of samples follow standard procedures designed to reduce most sources of sampling bias. Analytical bias is minimized by adherence to the methods listed in Table 2. The laboratory employs quality control procedures appropriate to the analytical procedures, including analysis of method blanks, matrix spikes, and check standards.

Table 2. Analytical methods and measurement quality objectives

Characteristic	Method	Reference	Reporting Limit	Precision	Accuracy	Bias
		lab	conc/units	%RSD	units/% error	%REC
temperature	thermistor	na	0.01 C	na	±0.15 C	na
dissolved oxygen	membrane electrode	na	0.01 mg/L	na	±0.2 mg/L	±20% (winkler)
conductivity	electrode	na	4 digits	na	±0.5% of reading	na
pH	glass electrode	na	0.01 units	na	±0.2 units	na
turbidity	nepholometric	SM 2130B	0.01 NTU	na	±2% of reading	na
total phosphorus	colorimetric	EPA 365.3	0.01 mg/L	15%	40%	10%
total kjeldahl nitrogen	colorimetric	EPA 351.4	0.1 mg/L	15%	40%	10%
nitrate-N nitrite-N	ion-chromotography	EPA 300.0	0.01 mg/L 0.05 mg/L	15%	40%	10%
chlorophyll *a*	fluorometric	SM10200F2C	0.8 ug/L	20%	45%	5%
phytoplankton	slide transect	na	na	na	na	na

Field Procedures

Clark County Water Resources utilizes a field procedure manual designed for volunteer lake monitors (Wierenga, 2003). Table 3 details the field procedures and sampling requirements for each characteristic.

Calibrating field instruments

A Hydrolab Datasonde 4 multi-probe and Hach 2100P turbidimeter are typically utilized for field data collection. Meters are calibrated by county staff prior to checkout by volunteers. The calibration and maintenance procedures, as described in instrument operation manuals, are followed.

Flow of field activities

Volunteers are trained to follow a general flow of sampling procedures. Monitoring dates are arranged by the team and confirmed with county staff to ensure equipment availability. Volunteers inspect field kits for completeness given the parameters to be monitored on each trip. Once at the desired sampling location volunteers begin with a general site assessment including weather conditions. Vertical profiles for physical parameters and Secchi disk readings are recorded, followed by collecting water samples. Volunteers verify that the tasked work has been completed before leaving the site and returning the equipment and samples to county staff.

Sample identification and handling

The station name and sample date identify samples collected by volunteers. County staff fills in ‘Client Name’, ‘Project Name’, and ‘Sample ID’ fields on bottle labels; volunteers fill in the ‘Date’ and ‘Time’ fields. Unique sample ID numbers are assigned by contracted laboratories. Water quality samples are collected in properly preserved bottles prepared by the laboratory, and stored on ice or refrigerated until delivery to the lab within 24 hours of collection. Formal chain of custody documentation is maintained for all samples sent to Addy Lab.

Sample collection
Lake samples are collected at station LACL11. Table 3 contains characteristics, sampling schedule, collection type, and container requirements for the project.

Field measurements for water temperature, dissolved oxygen, ph, and conductivity are collected using a calibrated Hydrolab Datasonde 4 multi-probe. Measurements are taken every 1m in the top 10 meters, and at 2m intervals from 10m to ~16m.

Water samples for total phosphorus, total Kjeldahl nitrogen, and nitrate + nitrite nitrogen analyses are collected from the epilimnion and hypolimnion using a vertical VanDorn-style sampling bottle. Secchi disk readings are taken on the shady side of the boat, with eye level just above the gunwale.

Chlorophyll *a* and phytoplankton samples are obtained by compositing three grab samples equally spaced through the photic zone. Photic zone depth is estimated as 2 times the measured secchi depth. Composite grabs are collected using a VanDorn-style sampling bottle and composited in a nalgene carboy, from which sub-samples are drawn. Chlorophyll-*a* samples are collected in bottles preserved with $MgCO_3$ and kept on ice until delivery to the lab. Phytoplankton samples are collected in bottles preserved with Lugol's solution and kept on ice until shipment to the lab.

Data management and field activity logs
The volunteers fill-in the appropriate fields on the data sheets, including the checklists detailing the actions required to verify the data and submit it to staff for review and entry into the database (See Appendix A for data sheet examples). Volunteers are directed to review all of the sheets and then initial appropriate fields indicating that the forms are complete. County staff completes the chain of custody forms when samples are submitted to the lab. County staff confirms that the data was received and reviewed for completeness, then enters available data into the Water Quality Database (WQDB). All field data sheets and sample tracking forms are bound and stored at the county office as a log of field activities.

Table 3. Sampling schedule, collection methods, and container requirements.

Parameter	Schedule*	Collection	Container/ Preservation
secchi depth	monthly	visual measurement	na
temperature	monthly	field meter, vertical profile	na
dissolved oxygen	monthly	field meter, vertical profile	na
conductivity	monthly	field meter, vertical profile	na
pH	monthly	field meter, vertical profile	na
turbidity	monthly	field meter, surface	na
total phosphorus	monthly	manual grab, 2 depths	500-mL HDPE/sulfuric acid
total kjeldahl nitrogen	monthly	manual grab, 2 depths	500ml HDPE
nitrate + nitrite nitrogen	monthly	manual grab, 2 depths	500-mL HDPE/sulfuric acid
chlorophyll *a*	monthly	Composite, photic zone	1L opaque HDPE/$MgCO_3$
phytoplankton	monthly**	Composite, photic zone	250ml brown LPDE/Lugol's
*May - Oct only			
**every 5 years			

Laboratory Procedures

Nitrate + nitrite, total Kjeldahl nitrogen, total phosphorus and chlorophyll *a* analyses are conducted by Addy Lab and/or Columbia Analytical services. All procedures are performed according to the laboratory's Ecology-approved quality assurance program and according to accepted conventions for data manipulation and reporting as described in Standard Methods (APHA, 1992). Table 2 shows constituents measured, analytical methods, and reporting limits. Phytoplankton analysis is performed by Aquatic Analysts according to the procedures described in Algal Analytical Procedures (Aquatic Analysts, 2001).

Quality Control

Laboratory QC

Laboratory check standards, matrix spikes, analytical duplicates, and blanks are analyzed in accordance with the lab's Quality Assurance Program. QC results are reported to Water Resources along with sample data. Laboratory data reduction, review, assessment, and reporting are performed according to the lab's Quality Assurance Program.

Field QC

Field QC sample types, frequencies, and definitions for Lacamas project water quality samples are found in Table 4.

Duplicate lake samples and field meter measurements are collected every other month. Transfer blanks and transport blanks are collected once annually.

Field meters are calibrated and maintained by County staff in accordance with manufacturer's instructions. Conductivity check standards and a National Institute of Standards and Technology (NIST) certified thermometer are used to verify field meter accuracy. Calibration logs are completed during each calibration and are archived in Water Resources files. Calibration drift in pH meters is checked against pH buffer solutions, and dissolved oxygen measurements are verified using a modified Winkler titration. These activities are used to confirm that field instruments are attaining stated accuracy and resolution specifications.

Table 4. Lacamas QC sample types, frequencies, and definitions.

Field QC sample type	Frequency	Definition
Field measurement replicate	every other month	repeat field meter measurements at one depth from vertical profile
Water sample duplicate	every other month	duplicate sample (all characteristics) collected for laboratory analysis
Transfer blank	annually	D.I. water sample collected in field with sampling equipment
Transport blank	annually	D.I. water sample prepared in office and carried through field trip

Corrective Actions

Data quality problems encountered in the analysis of QC samples are addressed as needed through re-calibration, modifications to the field procedures, increased staff training, or by qualifying results appropriately. Documentation of corrective action steps includes problem identification, investigation procedures, corrective action taken, and effectiveness of the corrective action.

Data Management Procedures

Volunteers record field data on standardized data sheets. Volunteers review field data sheets for errors and then submit a completed package to county staff for entry into the database and archiving in bound notebooks.

Contracted laboratories submit data either electronically in Excel spreadsheets or in paper reports. Hard copies of laboratory reports are stored in a project binder.

After review, data is entered or imported into the Water Resources WQDB. The WQDB is a centralized database in SQL Server format, utilizing Microsoft Access for data entry, editing, analysis, and reporting.

Data Analysis

Standard data analysis procedures utilize Microsoft Excel, Minitab, and WQStat Plus software packages. Statistical trends are evaluated using the non-parametric seasonal Kendall test. Typical graphical displays include time-series and box-and-whisker plots, as well as bar charts.

Data analyses may include the following:

- Determination of monotonic summertime trends in monthly TP and TKN for the epilimnion and hypolimnion.
- Determination of monotonic summertime trends in monthly water clarity (secchi disk).
- Calculation of annual summertime total phosphorus, secchi disk, chlorophyll-*a*, and phytoplankton Trophic State Index (TSI) values.
- Determination of monotonic summertime trends in monthly TSI values.
- Comparison of current TP, TKN, secchi, and turbidity measurements with state criteria and/or regional expectations.
- Assessment of summertime habitat availability, based on vertical profiles of water temperature and dissolved oxygen.
- Summary graphics of recent phytoplankton community structure.

Additional analyses may be performed as necessary.

Audits and Reports

Audits

The project manager and QC coordinator periodically review the field data, methods, lab results, and data management activities to make an assessment of the project and identify corrective actions or method revisions.

Reports

An annual data summary detailing field activity and preliminary results will be completed by county staff. Annual summaries will be completed before the field activities for the next year begin. Data summaries address project methods, present data, summarize data accuracy and completeness, describe any significant data quality problems, and suggest modifications for future monitoring. Reports are peer reviewed by Water Resources staff. Summaries will be made available to volunteers via e-mail list service or in hard copy.

Lacamas project reports are also provided to relevant local and state agencies, and may be included as attachments to the county’s annual NPDES permit compliance report to Ecology. Reports are posted on the Water Resources web page to facilitate dissemination of information to the public. Volunteer-collected data may also be used in periodic Water Resources' county-wide waterbody health reports.

Additional reports may be produced at the request of management.

Annual summaries generally do not provide a comprehensive discussion of historical lake monitoring results. Rather, their intent is to update and build upon the information provided by previous studies.

At longer intervals, typically every 3-5 years, trend analyses is completed using the current long-term data set. In these more extensive technical reports, overall lake condition, trophic status, and trends are discussed in the context of beneficial use support. Management implications and recommendations for future monitoring are also presented.

Data Review, Verification, and Validation

During each sample trip, volunteers review field and sample logs to confirm that all necessary field measurements and samples have been collected. Laboratory QC results are reviewed and verified by laboratory staff and documented in data reports to Water Resources. Upon receipt, laboratory data are reviewed for errors, omissions, and data qualifiers prior to data entry.

Data verification involves examination of QC results analyzed during the project to provide an indication of whether the precision and bias MQOs have been met. To evaluate whether precision targets have been met, pairs of duplicate sample results are pooled and an estimate of standard deviation is calculated. This estimate, divided by the mean concentration of the duplicate results and converted to percent, is used to judge whether the %RSD target has been met.

To evaluate whether bias targets have been met, the mean percent recovery of the check standards should be within +/- %bias target of the true value (e.g. true value +/- 10%). Unusually high blank results indicate bias due to contamination that may affect low-level results. To evaluate whether the target for reporting limit has been met, results will be examined to determine if any of the values exceed the required reporting limits.

Data validation consists of a detailed examination of the complete data package using professional judgment to assess whether the procedures in the SP's and QAPP have been followed. Data validation is performed by the project manager and QC coordinator.

Data review and verification are summarized semi-annually, while data validation is performed annually.

Data Quality Assessment

Taking into account the results of data review, verification, and validation, an assessment will be made annually as to whether the data are of sufficient quality to attain project objectives.

References

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Project: Lacamas Lake Ambient Monitoring Location Name: LACL II

Sampling Date: ____________________ Time: ____________________________

Field Crew: ____

Weather: Air temperature ______ (°C); Estimated wind velocity and direction __________

Surface Waves ____________________; Precipitation _____________________

Note: Entries for wind velocity, waves, and precipitation should be "light", "medium", and "heavy". Estimate general wind direction as N, NE, E, SE, S, SW, W, NW.

Turbidity Meter Calibration Date:	
Gelex Vial Expected Value:	
Gelex Vial Observed Value:	

Depth (m)	Water Temperature (°C)	pH (units)	Dissolved Oxygen (mg/L) and (%Sat)		Conductivity (*u*S/cm)	Turbidity (NTU)

Secchi Disk Depth (m): ______________ Composite Sample Depths (m): ______________

Sample Depth (m): ________________________ Total depth (m): _____________

Comments :

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