Devils Lake Water Improvement District

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Fecal Source Tracking Sampling & Analysis Plan

Written by: Paul Robertson, Lake Manager

Group A: Project Management

A1. Title and Approval Sheet

Paul Robertson, Lake Manager — Date
Devils Lake Water Improvement District

Steve Hanson / DEQ Volunteer Monitoring Specialist — Date

Chris Redman / DEQ Quality Assurance Officer (QAO) — Date

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A2. Table of Contents

A3. Distribution List

A digital copy of The Devils Lake Water Improvement District Bacteria Sampling and Analysis Plan (SAP) shall be available on the District's website (www.DLWID.org) with a signed paper copy kept on file at the District's office. Small changes which may occur to the document shall be identified by a systematic increase in the decimal of the version number (e.g. 1.1., 1.2, 1.3). Substantial changes are denoted by an increase to the next whole integer (e.g. 1.3, 2.1). This newest version shall replace all previous versions. Users will be able to find the updated version at the District's website, which shall be updated by the DLWID's Lake Manager. Users and signatories of this document shall be notified electronically of all changes. Users of the document are responsible for insuring they are using the most current version.

A4. Project/Task Organization

Table 1. DLWID Water Quality Monitoring Staff

Name	Title	Affiliation	Responsibility	Telephone	Email
Paul Robertson	Lake Manager & Senior Scientist	Devils Lake Water Improvement District	Project Manager & Quality Assurance Officer	(541) 994-5330	paul@dlwid.org
Seth Lenaerts	Water Quality Specialist	Devils Lake Water Improvement District	Sampling and Sample Prep	(541) 994-5330	seth@dlwid.org
Gale Ousele	Water Quality Technician	Neskowin Creek Water Testing 8105 Slab Creek Road Neskowin, OR 97149	*E. coli* testing	(503) 392-3927	galeq@oregoncoast.com
Dr. Kate Field	Professor of Microbiology Director, BioResource Research ,	Department of Microbiology 220 Nash Hall Oregon State University Corvallis, OR 97331	DNA Analysis	(541) 737-1837	kate.field@oregonstate.edu
Hyatt Green	Ph.D. Student in Microbiology	Department of Microbiology 220 Nash Hall Oregon State University Corvallis, OR 97331	DNA Analysis	(541) 737-1848	greenhy@onid.orst.edu

A5. Purpose Statement and Background

Thompson Creek is a 303d listed water body and a major tributary to Devils Lake. Listed for fecal coliforms in 1998, Thompson Creek has had historically high bacterial values dating back into the 1970's when the watershed was first surveyed. *E. coli* monitoring by DLWID, the Salmon Drift Creek Watershed Council and the Lincoln Soil and Water Conservation District have repeatedly shown that water quality issues continue to be present. As *E.coli monitoring* alone can only detect the presence and quantity of these organisms, and not the origin of the organism, a fecal source tracking with bacteroides genetic markers study has been put forth.

A6. Project Task and Description

DLWID staff will conduct field work and sample prep. Samples will be collected from the thalwag of Thompson Creek, a tributary to Devils Lake, in Lincoln County, Oregon. Staff will collect instantaneous grab samples for chemical, physical and biological water quality parameters. Parameters include pH, conductivity, dissolved oxygen, turbidity and temperature. Biological samples are collected for analysis of *E. coli* and for analysis of bacteroides genetic markers through PCR reactions. The results of this program will be used to determine the sources of fecal matter in the creek, which will lead to a better understanding and provide direction for management.

Table 2. Primary water quality monitoring tasks completed in in 2010.

Major Tasks	J	F	M	A	M	J	J	A	S	O	N	D
Staff Training							X	X				
WQ sampling							X	X			X	
E. coli monitoring							X	X			X	
DNA Sample Processing							X	X			X	
DNA analysis								X				X
Data processing and reporting												X
Ordering of Lab Consumables							X					

A7. Measurement Quality Objectives

For water quality data to inform decision making it is critical that the quality of the results themselves be assessed in order to understand the sampling error and the error of the measurements themselves. Sampling error will be determined by the natural variability of the environmental parameter, the distribution and type of samples in space and time, and the total number of samples.

Measurement 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, and data processing.

Specific Quality Assurance Objectives for the DLWID Water Quality Monitoring Program are:

- Collect a sufficient number of samples, sample duplicates, and field blanks to evaluate the sampling and measurement error.
- Analyze a sufficient number of Quality Control (QC) standards, blanks and duplicates during analysis to effectively evaluate results against numerical Quality Assurance (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.

Precision and Accuracy:

Table 3. Accuracy and Precision Target

Matrix	Parameter	Precision	Accuracy	Measurement Range
Water	*E. coli*	± 0.6 log	NA	≤ 1 to >2419

[1]Lower Limit of Detection (LLD) is provided. Measurement range can be extended through dilution of samples, but the Lower limit of Quantification (LLQ) is then increased by the dilution factor.

Representativeness: Samples are collected to most accurately represent the stream main flow, and are thus collected from the thalweg.

Comparability: This monitoring program will seek to ensure comparability between previous studies from other systems. This study may accompany other studies in the ongoing research and development of this type of fecal source tracking.

Completeness: DLWID staff strives to collect all the data described within the SAP. In order to accomplish this, preprinted waterproof sampling sheets are used detailing the sampling data to be collected. However, environmental and technical limits can and do prevent such a complete record to be collected over the course of the year. Where data are not collected, an entry describing why is recorded. If insufficient data are collected that would prevent the practical use of the data, then a partial dataset may be recorded with the limitations identified.

Sensitivity: Sensitivity relates to the ability of an analytical method to quantify concentrations relevant to a study and the ability of the study design to successfully answer the monitoring question. Analytical equipment purchased is designed to meet the level of sensitivity sought. Typically analytical sensitivity is one order of magnitude greater that a reporting level might prescribe. This is the case for the pH, conductivity, turbidity, temperature, and dissolved oxygen meters the District utilizes. Bacterial

samples while inherently highly variable are rigorously analyzed then calculated using the Most Probable Number (MPN). The method employed is EPA approved for reporting whole numbers less than 2419. This range is well suited for recreational water use standards. The DNA method is beyond the scope of this SAP.

A8. Training Requirements and Certification

The Devils Lake Water Improvement District Lake Manager is in charge on insuring proper training is conveyed to all parties. The current manager is Paul L. Robertson. Paul possesses a Masters of Science in Environmental Diagnosis from Imperial College London and a Bachelor of Science in Environmental Chemistry from the University of Vermont. Paul has 14 years of sampling and analytical testing experience.

Currently the District is also served by the skills of Seth Lenaerts, a Resource Assistance for Rural Environments (RARE) participant though the University of Oregon. Seth has a Bachelors of Science from University of Wisconsin, Steven Point, majoring in Land Use Planning with a minor in Soil Science.

Additionally, the Devils Lake Water Improvement District generally employs an intern each summer for water quality work. This intern's qualification range year to year, but selection criteria are high and include laboratory and field experience. Like all staff, the intern is formally trained on the protocols of the District by the Lake Manager, prior to sampling or analysis. Training includes review of the QAPP and all applicable SAPs. Additionally training videos and presentations are reviewed annually by all persons ahead of the conducting any formal analysis.

E. coli analysi is done by Gale Ousle who has been trained in the EPA approved protocol and serves many other entities for bacterial work which are also reported to DEQ.

DNA analytical work will be done by Hyatt Green and under the authority of Dr. Kate Field, Oregon State University who has developed this technique and published multiple papers to its effect.

A9. Documentation and Records

Table 4. Document and Data Retention Policy.

Document or Record Name and Description	Storage Location	Storage Time
Quality Assurance Project Plan (QAPP) - project description and assurance procedures.	DLWID Lab & Website	5 years
Sampling Analysis Plans (SAPs) - specific sampling information for each sampling program.	DLWID Lab & Website	5 years
OWEB Water Quality Monitoring Guidebook - Methods manual	DLWID Lab & OWEB Website	5 years
Equipment Notebooks - records of quality control checks, calibrations and maintenance.	DLWID Lab	5 years

Field Data Sheets - Field forms containing sampling meta data and raw field data, including sample drop off time for bacterial analysis.	DLWID Lab	5 years
Laboratory Data Sheets - Lab worksheets containing analysis meta data. Worksheets contain time checkpoints during analysis, dilutions, and final data.	DLWID Lab, NCWT, & Water Environmental Services, Inc.	5 years
Chain of Custody Sheets – Sheets documenting what samples were collected, where they were collected, at what time and by whom. Forms also include who shipped the samples, when, and who received the samples.	Receiving Lab	5 years
Analytical Results – Data are archived digitally in MS Access and/or Excel	DLWID Lab	Indefinite
ODEQ Original Record- Data submitted to DEQ by DLWID for review, reformatting and upload into LIMS, usually a Microsoft Excel workbook.	DLWID Lab	5 years
Final LIMS Report - Approved result values for each volunteer dataset submitted for upload to LASAR	DEQ Laboratory: Final LIMS Report	5 years

Group B: Data Generation and Acquisition

B1. Sampling Process Design

In an effort to determine the source of fecal matter entering Thompson Creek, a bacteria sampling and analysis protocol has been developed for *Escherichia coli*. *E. coli* bacteria are indicator organisms of pathogenic bacteria and organisms. This study is then being coupled with a DNA based bacteroides genetic markers study. The genetic markers are particular to host species, and thus through this joint monitoring effort, the source of fecal contamination is thought to be ascertainable.

General Information:

Sampling is to be done in both the drier summer months and during the rainy season of Novemeber. The sample sites are all on Thompson Creek, and are label TC-0, TC-1, TC-2, …moving upstream from the mouth of the system These are established sites already understudy in most cases. Where a new sample site is identified, it will be given a new designation which may include TC-1.1 or the like for a sample between sites 1 and 2. Analysis is done the same day at Neskowin Creek Water Testing Center (NCWTC), 10005 Slab Creek Road Neskowin, Oregon 97149. Contact is Gale Ousele: Office Phone (503) 392-6134 Messages at (503) 392-3927. Sample must be analyzed within 6 hours of sampling.

Samples are also taken, filtered, and preserved in preparation of analysis by PCR. The DNA based analysis is beyond the scope of this SAP, but the processing of the samples is part of this SAP and is detailed below. For references on the DNA analytical technique refer to Field, *et.al* 2010.

Sample IDs and Descriptions:

Thompson Creek (TC) This creek is the second largest input into Devils Lake and is a 303d listed stream for fecal coliforms. The KBCH Radio tower is the nearest landmark. The creek drains forested land uphill, but passes through a built up rural landscape at its terminal end. Septic systems serve the homeowners and houses are built right to the creek bed. The creek also passes by a horse farm, followed by the KOA Campground, before passing under East Devils Lake Road and into a dredged inlet that follows the peninsula that is Sand Point. Sample points are at the mouth of the creek as it enters the canal, upstream from the East Devils Lake Road Culvert, at a private road crossing above the horse farm, at the upstream of the Park Lane Culvert, at a second private road crossing above that, and at the headwaters of the main stem.

Universal ID	DEQ LASER ID	Latitude (N)	Longitude (W)	Short Description
TC-0				Mouth of Thompson Creek
TC-1				Upstream of EDLR culvert
TC-2				Upstream of culvert above Horse farm on private road
TC-3				Upstream of Culvert on Park Lane
TC-4				Upstream of culvert on Private Road #2
TC-10				Headwaters

Map of sites:

B2. Sampling Methods Requirements

E. coli: Each sample is taken into a sterile, labeled 100 ml sample bottle purchased from IDEXX. Sodium thiosulfate has been added by the manufacturer to the prepackaged, sealed bottles to reduce the presence of chlorine which acts as a disinfectant. Disinfected samples could lead to a false negative result. The labels and lids clearly state the station ID written in indelible ink.

A record of the sample ID and corresponding sample site station is maintained. Forms preprinted on Rite in the Rain paper are used to record the supplemental data during the sampling routine. The forms are entitled "Devils Lake Water Improvement District Fecal Source Tracking Sampling Sheets". For each sampling day, the date, sampler initials, weather, air temperature and wind speed are recorded. For each sample, the sample time is also specified. At each sample site, a record of the type(s) of samples made (e.g. Grab, Replicate, and/or Split) is kept. Other data recorded include the Dissolved Oxygen in mg/l; Temperature in degrees Celsius; pH; Conductivity in microSeimens; Turbidity in Nephlometric Turbidity Units; Secchi Depth in meters where appropriate, and wind data including average, maximum and direction. These samples and readings are taken in accordance with the Devils Lake Water Improvement District Physical Monitoring Protocols. Also on the Rite in Rain preprinted forms the drop off time to the lab is recorded as are any comments from the sampling day.

Samples are taken just below the surface of the water, by plunging the bottle upside down into the water ensuring that the sodium thiosulfate is not spilt. Creek samples are taken in the thalweg (mid stream & highest flow). The sample bottle is quickly covered with the clean lid, insuring that no cross contamination takes place. The rim of the bottles and the insides of the lids and bottles are never touched, and are kept free from possible contamination including wind borne bacteria. One sample split is taken each sampling day. Split samples are labeled with a "s" or "Split". This sample is collected into a larger bottle for separation at the lab. Two samples are run using the IDEXX methodology. Additionally one sample replicate is taken each sampling day from a random location. Replicates are collected simultaneously into two distinct sample bottles. Replicate samples are labeled with "Rep".

The samples are placed in an iced cooler immediately following sampling and are kept cool during transit. All samples are collected and transported to the lab within 4 hours preferably and no longer than 5 hours after the first sample was acquired.

Table 5. Sample Containers, Preservation and Holding Times.

Parameter	Sample Container	Preservation Method	Holding time (Max)	Equipment
E. coli	Sterile, 100 ml screw, top plastic sample cups	Sodium thiosulfate & Iced Cooler	6 hours	Sample Grabber
DNA	Sterile 250 ml, screw top plastic bottles	Iced Cooler	3 hours	Sample Grabber

DNA Samples: Samples are taken in to sterilize 250 ml plastic sample bottles at the same time as the *E.coli* samples. Samples are similarly collected just below the surface of the water, by plunging the bottle upside down into the water. Samples are taken in the thalweg (mid stream & highest flow). The sample bottle is quickly covered with the clean lid, insuring that no cross contamination takes place. The rim of the bottles and the insides of the lids and bottles are never touched, and are kept free from possible contamination including wind borne bacteria.

One sample split is taken each sampling day. Split samples are labeled with a "s" or "Split". Two samples are prepared from this split sample bottle. Additionally one sample replicate is taken each sampling day from a random location. Replicates are collected simultaneously into two distinct sample bottles. Replicate samples are labeled with "Rep".

The samples are placed in an iced cooler immediately following sampling and are kept cool during transit. All samples are collected and transported to the lab and analyzed within 3 hours.

Sample Types:

REGULAR SAMPLES: Collected and labeled using the Universal ID (e.g., TC-1).

REPLICATE SAMPLES: Taken from the same site at the exact same time are marked with an additional "Rep" on the label (e.g., TC – 1 Rep).

SPLIT SAMPLES: Taken in large bottle and denoted with the letters 'Split' or 's' (e.g., TC-1 Split or TC-1s).

BLANKS: Created from 100 ml of deionized water measured in sterilize graduated cylinder and labeled Blank-1 and Blank-2. Blanks are created after a regular sample has been processed to insure clean technique.

B3. Sample Handling and Custody Procedures

Escherichia coli samples will be collected into sterile, labeled 100 ml sample bottles. Both the sample bottles and lids are clearly labeled as a matter of quality assurance for the lab. The samples will be transported on ice, in a cooler, and analyzed within the designated holding time (six hours).

DNA samples will be collected into sterile, labeled 250 ml sample bottles. Both the sample bottles and lids are clearly labeled as a matter of quality assurance for the lab. The samples will be transported on ice, in a cooler, and processed the same day as the sampling occurs and within 3 hours of the sample.

DNA sample prep is done by DLWID staff at the District lab. Samples are all process the same day with the filters kept at or below -10C until batch shipment to Oregon State University where they are retained at -80C until final analysis.

DNA Sample Processing Equipment and Supplies:

- Lab coat, safety goggles and gloves
- Filter unit: Glass microanalysis 47mm unit (borosilicate glass 300 ml funnel and base, fritted glass support, anodized aluminum clamp, No. 8 stopper)
- Filter flasks (glass side-arm flasks) with tubing and stoppers; two each, 1 to support filter unit, 1 in series between filter flask and vacuum source
- Vacuum pump or other vacuum source
- Filter forceps
- (Sterile toothpicks, optional)
- Sterilization source for forceps (bleach and water, or flame)
- Deionized water, 10% bleach solution
- Supor-200 membrane filters, 0.2µm, 47mm (Pall)
- 0.5ml aliquots of Buffer AL from Qaigen
- 10ml disposable leak-proof cryotubes
- Wash bin and Drying rack

Disposal: After filtration, water is sterile; discard down the sink

Safety: Wear gloves, lab coat and goggles. Always treat unfiltered water samples as if they are contaminated with pathogens. Keep them contained and clean up with bleach solution.

GITC buffer is toxic; avoid contact with skin. Standard good lab practice should always be followed. Consult the Material Safety Data Sheet for information on hazards associated with undiluted powdered GITC. Most safety precautions for guanidine isothiocyanate apply to undiluted powdered GITC; workers mixing the stock solutions should use a mask and skin protection and work under a hood with spill protection.

Store 5M GITC at room temperature in the dark.

Aqueous 5 M GITC buffer has negligible vapor pressure and so does not present a hazard from fumes, and presents negligible hazard from splashing. The Oregon State University Health and Safety Office advises that under these conditions, skin protection (gloves and a lab coat) constitute adequate protection. Workers should wear nitrile gloves and skin protection. If there is a spill, it should be mopped up with paper towels that should then be placed in a plastic bag. Broken or leaking tubes should also be bagged and discarded according to university regulations. Wipe the work area with a wet paper towel after a spill to minimize dust. The Health and Safety Office at Oregon State University advises that contaminated tubes or other materials may be rinsed in the sink if needed.

Setup:

1. Vacuum filtration unit is prepared as follows: Pump is placed on the floor safely away from work space. Tubing is ran to a water trap, then to the secondary side arm flask which is connected in series to the primary sidearm flask. The secondary flask is set in a small cooler to stabilize the overall set up and prevent breakage.
2. Filter glassware, stoppers, graduated cylinders, forceps and clamps are sterilized in cold 10% bleach and deionized water solution. Items are then rinsed 3X with deionized water and left to air dry on a clean rack away from contamination sources.
3. The bottom part of the filter unit is assembled unto the primary sidearm flask.
4. Open sterile filter is opened ad placed on the fritted surface of the filter assembly with sterilized forceps
5. The top unit of filter is assembled, and securely clamped.
6. Samples are prepared one at a time, including all blanks, replicates and splits. Sterile practices are maintained throughout.
7. Measure off 100 ml of sample into sterile plastic graduated cylinder.
8. Vaccum pump is turned on.
9. 100 ml aliquot of sample is poured through the filter assembling with care to insure that the sidewalls are not contacted if possible, but the sample is poured directly on the filter.
10. Graduated cylinder is rinsed with deionized water and poured onto filter. Process is repeated two more times.
11. Upper assembly of filter unit is rinsed 3X with deionized water, insuring all sidewalls are cleanly flushed to the filter.

12. Pump is shut off.
13. The top half of the filter assembly is removed and place in 10% bleach solution.
14. Using sterile forceps the filter is carefully roll the filter. Do not touch tany contaminated surface to the fret of the filtration unit.
15. Insert the rolled filter into a 10 ml, labeled cryogenic vial containing 0.5 ml of Buffer AL. Insure the filter goes to the bottom.
16. Cap and invert the vial several times to insure the entire filter is wet with the buffer solution.
17. Place the labeled tube into the freezer for storage until batch shipment to OSU
18. Sterile the forceps and filtration unit in 10% bleach solution for 3 min followed by several deionized water rinses
19. Repeat process with each sample.
20. For each sampling date prepare 2 filtration negative controls by following the same procedure, but substitute sterile deionized water for the water sample. Each control should be done after an actual sample is processed.

B4. Analytical Methods Requirements

E.coli analysis is done by Neskowin Creek Water Testing. The water quality technician is Gale Ousele. The samples are run using the EPA approved Method developed by IDEXX called Colilert®-18. A sample preparation video is available at the following web address: http://www.idexx.com/water/colilert18/index.jsp

General protocol is demonstrated by the following 4 steps:

Step 1.
Add reagent to sample.

Step 2.
Pour into Quanti-Tray® (counts from 1-200) or Quanti-Tray®/2000 (counts from 1-2,419).

Step 3.
Seal in Quanti-Tray® Sealer and place in 35 °C incubator for 18 hours.

Step 4.
Quanti-Tray-Read results:
- Yellow wells = total coliforms
- Yellow/fluorescent wells = E. coli

Quanti-Tray/2000-Read results:
- Yellow wells = total coliforms
- Yellow/fluorescent wells = E. coli

Table 6. Analytical Methods and Equipment.

Parameter	Method	Units	Equipment
E. coli	IDEXX, Colilert®-18	MPN	Sealer, UV light

DNA analysis is done by Dr. Kate Field and/or Hyatt Green of Oregon State University.

B5. Quality Control Requirements

Table 7. Required Quality Control Measurements

PARAMETER	ACCURACY	PRECISION
E. coli	• Daily blanks run with each sampling batch • Split samples ran from each sampling batch.	• Replicates made every day or at 10% of sampling sites, whichever is greater • Replicate sampling done simultaneously • A level is a difference between the logs of the values ≤ 0.6.
DNA	• Two Daily blanks run with each sample batch • Splits run from each sample batch	• Replicates made each sampling day or at 10% of sampling sites, whichever is greater • Replicate sampling done simultaneously

B6. Instrument/Equipment Testing, Inspection & Maintenance Requirements

An instrument log accompanies each piece of analytical equipment. All service checks and inspections are recorded into the log. All reagents and supplies are checked at the start and end of the sampling day for expiration dates, damage, contamination, or degradation. Problems with any supplies (quality or quantity) and/or equipment are communicated to the Lake Manager and recorded on the dry-ease board in the lab and in maintenance logs as appropriate. Supplies are ordered on an as needed basis.

Table 8. Equipment Testing, Inspection and Maintenance Requirements

Equipment Type	Inspection Frequency	Type of Inspection
IDEXX QuantiTray Sealer	• Yearly or as needed	• Take apart and clean
Incubator	• Prior to and at end of sample incubation	• Check thermometer reading

B7. Instrument Calibration and Frequency

No instruments used in this protocol have calibration requirements.

B8. Inspection/Acceptance Requirements

All equipment, supplies, reagents, and instrumentation are securely stored in the Devils Lake Water Improvement District laboratory or the Neskowin Creek Water Testing Center. These are climate controlled facilities. Time sensitive reagents are clearly

labeled with a chemical inventory sticker. Each sticker contains the date received, the date the item was opened, and the date the item expires.

B9. Data Acquisition Requirements

The Devils Lake Water Improvement District utilizes a Geographic Information System (GIS) for determining location of sampling sites, property ownership, land-use, and many other attributes about the watershed. These database files or GIS layers are obtained from reputable sources, specifically Lincoln County Planning and Development, Oregon Department of Geology and Minerals, the US Environmental Protection Agency, The US Department of Agriculture, and Oregon State University. Similarly, Streamflow and weather data may be retrieved by the District online or by contacting directly the USGS, Oregon Water Resources Department, and Oregon Climate Center for analysis and presentation purposes. Unless noted otherwise in the retrieved data, the quality of these results will be assumed to be of sufficient quality to use when analyzing DLWID's data. The limitations of all data collected will be referenced in any reports or presentations. Data acquired from non-governmental, third parties will not be uploaded into LASAR.

B10. Data Management

Field data are collected straight onto pre-printed, water proof paper. Each data parameter of interest is given a specific box for the researcher to fill in. For samples collected, boxes indicating if the sample is a grab, a replicate or a split are provided. Additional comment lines are provided for observations otherwise not collected. Data are transferred to a digital record for permanent storage and data manipulation. To increase the long-term digital integrity of the data, the Devils Lake Water Improvement District recently purchased a new computer with dual hard drives. Data are automatically stored on two separate hard drives in case of failure. Additionally, data are routinely backed up to external drives, and to web-based data storage systems.

Data are entered into spreadsheets and/or databases by staff and/or by outside labs. Thesefiles are then directly archived as a permanent record with DLWID. Data are also currently being prepared for submission into DEQ's LASAR database. This is an online database managed by DEQ for data integrity. As a result data are presented to DEQ using specific submission criteria detailed in Table 10. All data in the DEQ's database must be associated with a physical location defined by a latitude and longitude. Where existing LASAR sites do not match DLWID's sites, new LASAR IDs will need to be created. For new sites, DLWID will provide DEQ with specific coordinates in latitude and longitude from the District's GIS. The associated datum of the coordinates along with a map image of where new stations are will also be submitted.

Submitting Data: Example formats for submitting grab and continuous water quality data can be found on the DEQ's Volunteer Monitoring web page. If DLWID is submitting data for a parameter not currently on the upload template's "Raw Data" worksheet, then DLWID must specify what fields will be submitted for the new parameter. Generally

these fields will include analytical organization, method, units, result value, data quality level, and comments. It may also be necessary to include laboratory batch numbers to link result values to appropriate QC results. DLWID should verify data submittal fields with their analytical laboratory and the DEQ volunteer monitoring specialist and include the fields in their approved SAP.

Table 9. DEQ Volunteer Monitoring Program Data Monitoring Procedures

Input	Action	Responsible Party	Output
Instantaneous Grab Water Quality Data			
Raw Field Data and Quality Control Results	Internal data management including review for reasonableness, completeness, data quality, existing DEQ LASAR stations, entry into electronic data storage, and formatting of data, including duplicate data, and assigned data quality level into an approved electronic format.	DLWID	Completed electronic data submittal file for DEQ.
Submitted Raw Field Data (DEQ's "original record")	Review for formatting and completeness; create new LASAR stations for new locations, assign appropriate DEQ parameter codes, sampling organization codes, and analytical organization codes.	ODEQ Volunteer Monitoring Specialist	Completed Request For Analysis (RFA) (LIMS field sheet) Needed codes for electronic upload to LIMS
Submitted Raw Field Data	Quality assurance review and reformatting data. Review and analyze all reported quality control information including splits, accuracy reports, duplicates and other results. Review/assign data quality levels to each reported result. Reformat submitted data to LIMS electronic upload comma separated values format and assign all associated LIMS codes. Email electronic upload file and RFA to ODEQ Sample Coordinator.	ODEQ Volunteer Monitoring Specialist	QA memo LIMS electronic upload comma separated file
LIMS Electronic Upload File and RFA	Create LIMS Sampling event number and upload into LIMS	ODEQ Sample Coordinator	DAR
DAR	Review for successful upload and approve DAR.	ODEQ Volunteer Monitoring Specialist, ODEQ Managers	Approved DAR
Approved DARs	Print and sign Final Report.	ODEQ Sample Coordinator	Official Printed Final Report signed.
Release Data	Transfer electronic data to LASAR	ODEQ Technical Services staff	Data accessible on the DEQ webpage
Data in LASAR	Check on sampling event loading into LASAR, review 10% of sampling events for correct data transfer.	ODEQ Volunteer Monitoring Specialist	Verified LASAR data

Group C: Assessment and Oversight

C1. Assessment and Response Actions

Refer to Quality Assurance Project Plan

C2. Reports to Management

Quality controls are reported to Quality Assurance Officer by laboratory staff. With each sampling dataset, a hardcopy of the analysis is sent from the lab. In this analytical reporting sheet are the quality control values of reagent blanks, split samples and replicate sampling.

Group D: Data Validation and Usability

D1. Reports

Bacteria results are generally available within 24 hours from sample delivery. The data are emailed to the Devils Lake Water Improvement District by the Neskowin Creek Water Testing Center.

DNA results are provided after batch samples are processed.

Data are submitted to Oregon Department of Environmental Quality at the end of the study or on an annual basis.

D2. Data Review, Validation, and Verification

Refer to Quality Assurance Project Plan

D3. Validation and Verification Methods

Refer to Quality Assurance Project Plan

D4. Reconciliation with Data Quality Objectives

Refer to Quality Assurance Project Plan

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Fecal Source Tracking Sampling and Analysis Plan

Appendix

Appendix A: Fecal Source Tracking Sampling Sheet

Devils Lake Water Improvement District

Date: _____ Sampler(s) Initials: _____

Calibration Record:	% DO	DO	pH	EC	Turb

TIME				SAMPLES			DO	DO	Temp YSI	pH
Sample	Analysis	Station	ID	Grab	Replicate	Split	% Sat	mg/L	°C	
		QC - Start								
		Mouth	TC-0							
		EDLR	TC-1							
		Privat Road #1	TC-2							
		Park Lane	TC-3							
		Private Road #2	TC-4							
		Headwaters	TC-10							
		Replicate	TC-__ R							
		Blank -1	Blank-1							
		Split	TC-___S							
		Blank 2	Blank-2							
		QC-End								

Drop off Time: _____

Analysis Time Start: _____ Finish: _____

Comments: