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ECOLOGY

Quality Assurance Project Plan

Bertrand Creek and Meadowdale Areas (Whatcom County) Follow-Up Study of EDB and 1,2-DCP in Residential Wells

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Quality Assurance Project Plan

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January 2007

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Abstract

Ethylene dibromide (EDB) and 1,2-dichloropropane (1,2-DCP) are soil fumigants that are present in groundwater in northeastern Whatcom County. The Sumas-Blaine aquifer is the primary source of drinking water in the area. Groundwater was initially discovered to be contaminated in 1984 during a statewide investigation. Alternate water sources were supplied to those residents where contamination was documented or suspected. A more comprehensive study was conducted in 1998 which focused on drinking water from 123 private domestic wells in the Bertrand Creek and Meadowdale areas near the city of Lynden, Washington. The purpose was to refine the nature and extent of EDB and 1,2-DCP contamination in groundwater and determine the fate and transport mechanisms.

This is a follow-up study that will define the current condition of the aquifer and it is designed to supplement the existing data collected in 1998 by O'Herron. This is a one-time sampling project that will target approximately 30 private domestic wells. A subset of the wells previously sampled in 1998 will be resampled in this study, plus additional wells which have never been sampled before. The goal of this project is to: (1) update previous findings to provide a current picture of the contaminant levels, (2) determine the extent of the contaminant plumes, (3) determine the natural attenuation rate of EDB and 1,2-DCP concentrations in the area, and (4) verify the adequacy of the supplemental drinking water program.

Background

The Sumas-Blaine aquifer spans an area of 150 square miles and is the primary drinking water source for area residents. In Canada, it is called the Abbotsford aquifer. It is hydraulically connected to the surface waters in the watershed. Due to the highly permeable hydrostratigraphic units, the aquifer is vulnerable to contamination, with widespread nitrate contamination and known plumes of pesticide contamination beneath the Meadowdale and Bertrand Creek neighborhoods. Figure 1 illustrates the location of the previously studied areas.

The Sumas-Blaine surficial aquifer is the principal aquifer in the Nooksack watershed (Water Resources Inventory Area #1). The aquifer is comprised mainly of permeable sand and gravel glacial outwash deposits as well as alluvial deposits from the Nooksack and Sumas Rivers. The aquifer is largely unconfined and shallow, with depths to water commonly less than ten feet below land surface. These hydrogeologic characteristics create an aquifer which is highly susceptible to contamination from surface activities. Figure 1 illustrates the location of the Sumas-Blaine Surficial Aquifer and the area of focus by this study.

The Sumas-Blaine surficial aquifer was identified as one of the most severely contaminated aquifers in Washington State, (Tooley and Erickson, 1996). This aquifer is vulnerable due to the permeable soils, the shallow water table, and the historic and continued agricultural land use.

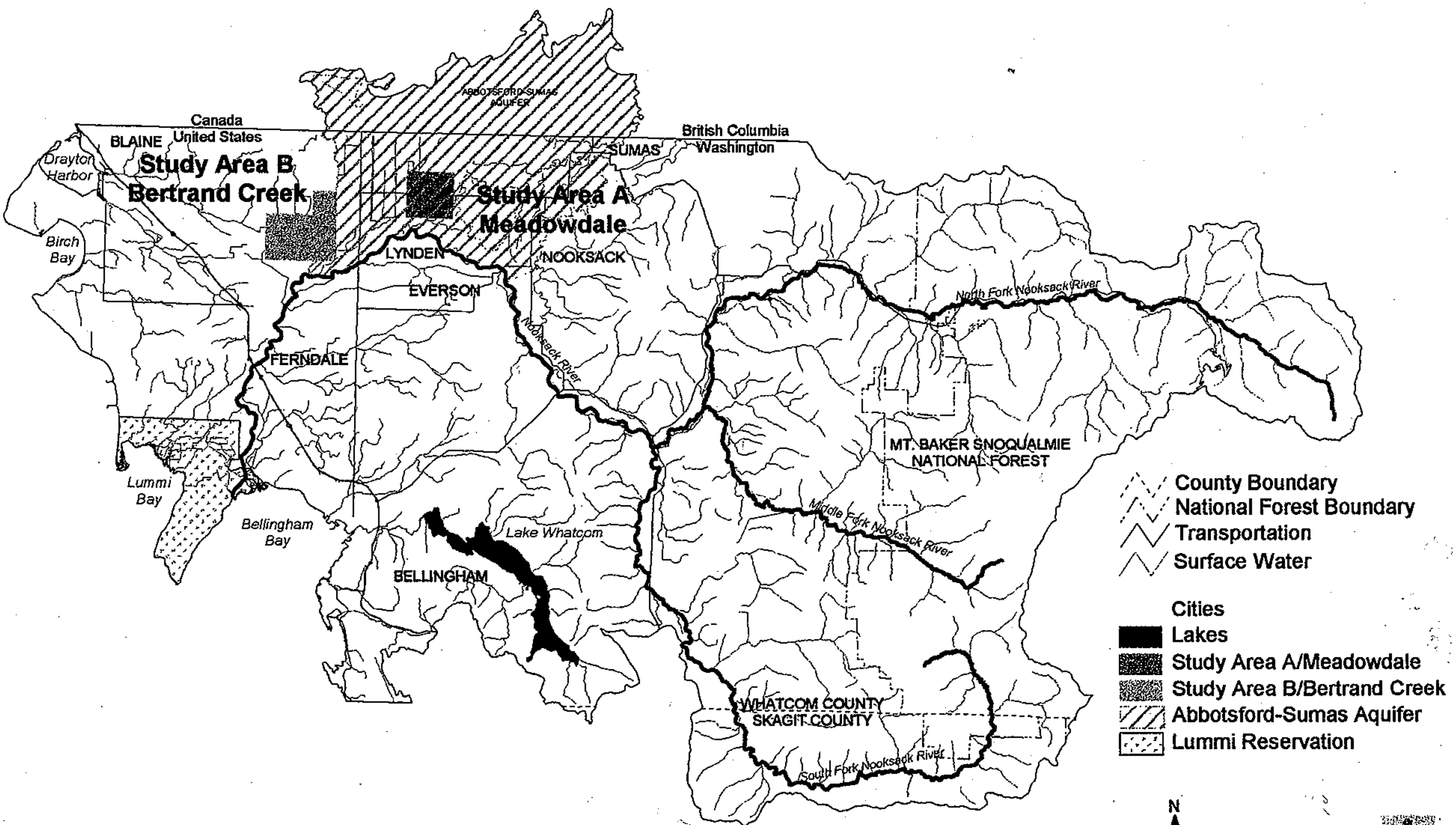

Figure 1. Study Areas A and B
Bertrand Creek/Meadowdale 1998 Study

Pesticide Use

Ethylene dibromide (EDB) and 1,2-dichloropropane (1,2-DCP) are fungicides (nematocides) which were used as soil fumigants to control root worms on raspberries, strawberries, blueberries and seed potato crops. EDB was used from 1940 until 1983, when the U.S. Environmental Protection Agency (EPA) banned it from agricultural use due to its carcinogenic properties. EDB is a persistent chemical that remains in the soils and groundwater. 1,2-DCP is also used in chemical manufacturing. EDB and 1,2-DCP are volatile organic compounds that can affect human health through consumption, inhalation and skin adsorption, (Duff, 2000)

Previous Studies

Bertrand Creek and Meadowdale are two areas near Lynden, which were included in a 1984 study that identified areas within the state which are contaminated by pesticides. Further investigation delineated the area-wide extent of the contamination and determined that EDB and 1,2-DCP were the primary organic contaminants, (Erickson and Norton, 1990).

In 1988, a program was developed which supplied alternative water sources to those homeowners whose groundwater was contaminated or suspected to be contaminated. This was achieved by connecting the Meadowdale Water Association (northeast of Lynden) to the City of Lynden's water supply and providing bottled water to affected residents in the Bertrand Creek area (west of Lynden). At that time, municipal water connections were not extended to all residents with contaminated water. In areas where the population was sparse and the distance to the Lynden municipal water supply was too great, extending the water line was cost prohibitive so bottled water was made available as an alternate drinking water source. Beginning in 1999, the Washington State Department of Ecology (Ecology) also offered showerhead filters to reduce inhalation exposure which occurs during showers, (O'Herron, 1999a).

In 1998, O'Herron sampled 123 wells both within and outside of the bottled-water delivery area. These wells were sampled for EDB/DBCP (1,2-dibromo-3-chloropropane), volatile organic compounds (VOCs), including 1,2-DCP, hardness, nitrate-nitrite, chloride, calcium, magnesium, sodium, potassium, total coliform bacteria, and field parameters. A small subset of wells near the areas with historical contamination were sampled for additional pesticides and herbicides.

- **Ethylene dibromide (EDB)** was detected in 14 wells out of 123 sampled (11%) within the Bertrand Creek area. Eight of these detections exceeded the maximum contaminant limit (MCL) of 0.05 ug/l for drinking water. Seventy-five percent of these exceedences (n= 6) were along Birch Bay-Lynden Road, east of the Bob Hall Road intersection. Within the same area, another 3 EDB detections occurred at levels below the MCL but above the detection limit of 0.02 ug/l. EDB concentrations in this area correlate with the findings of other investigations. Because they found no EDB in neighboring wells to the East, North, and West, O'Herron (1998) concluded that the EDB plume had not migrated or expanded significantly from the past. A new area of EDB contamination was identified along Willeys Lake Road in two wells almost a mile South of where it had been in the past. In Meadowdale, no elevated EDB concentrations were found.

- **1,2-DCP** concentrations exceeded the MCL of 5.0 ug/l in 6 of the 123 wells sampled (5%). Concentrations exceeded the practical quantification limit (PQL) of 0.25 ug/l at an additional 28 locations. Nineteen of these PQL exceedances are located along the Birch Bay-Lynden Road and the southernmost part of Bob Hall Road. Twenty-one percent of these exceeded the MCL. 1,2-DCP also appeared in concentrations above the PQL, but below the MCL, in two wells in Meadowdale. More focused sampling revealed an additional 13 wells in British Columbia, Canada, which exceeded the PQL. Fifteen percent of these wells exceeded the MCL.

- **Nitrate** was detected in 118 of the 123 wells (96%), with concentrations above the MCL of 10 mg/L in 48 (39%) of the total wells sampled.

- **Other Parameters**

  Additionally, coliform bacteria was present in 78 of the 123 wells (63%) and E. Coli bacteria was present in 9 of the 78 wells (12%) of those wells testing positive for coliform bacteria.

  A variety of other chemicals were detected in groundwater; all at concentrations below the corresponding MCL, (O'Herron, 1999a).

By 1999, groundwater studies by Ecology, EPA, and the United States Geological Survey (USGS) showed contamination was more widespread than previously thought. The same year, Ecology determined that extending a water line from Lynden to Bertrand Creek area homes with contaminated wells would be the least expensive long-term fix for the problem. In 2001, Ecology reached an agreement with the City of Lynden for construction of a water line to serve homes in the Bertrand Creek area that had drinking water contaminated with unsafe levels of EDB or 1,2-DCP. Construction of a 5.4 mile water line was completed in 2002. Initially, 50 homes were eligible for connection. Not all area homes were eligible to connect to the City of Lynden water line. Municipal water was available only to deal with the public health risk created by elevated levels of EDB or 1,2-DCP.

After the 1999 sampling event, several additional homes in the area were found to have EDB and 1,2-DCP contaminated drinking water. Ecology collected some additional samples from residential wells, but most of the subsequent sampling results were based on owner collected samples in 2001 and 2002 at residences where owners had chosen not to participate in previous sampling events.

Potential Health Effects

Ethylene Dibromide (EDB)

Ethylene dibromide is a known human carcinogen. The EPA has established a MCL for EDB at 0.05 ug/l. Even short-term exposure to EDB at levels above the MCL of 0.05 ug/l can cause damage to the liver, stomach, adrenal glands, and reproductive system, particularly the testes. Inhalation may cause irritation of the nose, throat, and lungs, loss of appetite, headache, and depression. Long-term ingestion can cause damage to the nervous system, respiratory system, heart, liver, and kidneys, (Duff, 2000).

1,2-DCP

Short-term exposure to 1,2-DCP may damage the liver, kidneys, adrenal glands, bladder, and gastrointestinal and respiratory tracts. Chronic exposure may damage the liver, kidneys, bladder, gastrointestinal tract, and respiratory tract, and cause cancer, (Duff, 2000).

Nitrate

Nitrate was identified by the EPA as a primary contaminant and has an MCL of 10 mg/l. Excessive levels of nitrate in drinking water interfere with the oxygen-carrying capacity of the blood in infants, causing methemoglobinemia, or *blue baby syndrome*. Long-term exposure in adults causes diuresis, increased starchy deposits, and hemorrhaging of the spleen. Research has also discovered a possible association between high nitrates and the development of cancer, (Duff, 2000). Nitrate contamination was not a factor considered when determining whether bottled water or hook-up to the municipal water line would be provided to individual homes.

Project Description

This study is a follow-up to the O'Herron study conducted in 1998. The goals of this study are to confirm the present location and concentration of the plumes, determine the attenuation rates, and evaluate the appropriateness of the extent of the water line connection program. Approximately 30 domestic wells within the Bertrand Creek and Meadowdale study areas will be tested for EDB, 1,2-DCP, and nitrate-nitrite-N. This is a one-time sampling event which will include both homes that were tested in the 1998 study as well as homes which have never had their water tested before. Table 1 provides a timeline for this project.

Tasks to meet these objectives are:

- Identify wells which qualify to be included in this study.
- Collect water quality samples from approximately 30 homes for EDB, 1,2-DCP, and nitrate-nitrite-N.
- Determine the current contamination concentrations.
- Delineate the extent of the contamination plume.
- Determine the natural attenuation rates of EDB and 1,2 DCP.
- Assure that all households that are eligible for connection to the water line program are offered the opportunity to connect.
- Summarize the results and prepare a technical report.

Organization and Schedule

Organization

Client	Mary O'Herron, Toxic Cleanup Program (TCP), Bellingham Field Office (BFO)	360-738-6246
Project Lead	Melanie Redding, Environmental Assessment (EA) Program	360-407-6524
Project Assistant/ Environmental Information Management (EIM) Data Engineer	Tanya Roberts, EA Program	360-407-7392
Quality Assurance	Bill Kammin, EA Program	360-407-6964
Laboratory Services	Stuart Magoon, EA Program Jeffery Westerlund, EA Program	360-871-8801 360-871-8800

Schedule

Table 1. Proposed Project Timeline by Task.

Task	2006						2007											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Quality Assurance project Plan/Project Planning		•	•	•														
Well Network/Sampling																		
Well inventory			•	•	•													
Database development		•	•	•	•													
Initial well selection and network design			•	•	•													
Well access arrangements			•	•	•													
Well sampling						•	•	•										
Well owner result notification									•	•								
Environmental Information Management (EIM) System																		
EIM project development						•	•	•										
Laboratory Information Management System (LIMS)/field data migration to EIM							•	•	•	•	•							
EIM project quality assurance and closeout										•	•	•	•					
Data Analysis and Reporting																		
Compile, evaluate, and summarize project data								•	•	•	•							
Data quality assurance and review								•	•	•	•							
Develop figures, tables, and map templates for report										•	•							
Prepare draft report											•	•						
Client review of draft report													•					
External draft review														•				
Finalize report															•	•		

Environmental Information System (EIM) Data Set	
EIM Data Engineer	Tanya Roberts
EIM User Study ID	mkim0001
EIM Study Name	EDB and 1,2-DCP in Drinking Water, Follow-Up Investigation: Bertrand Creek and Meadowdale Areas, Whatcom County, Washington.
EIM Completion Due	July 2007
Final Report	
Author Lead	Melanie Redding
Schedule	
Draft Due to Supervisor	May 2007
Draft Due to Client/Peer Reviewer	July 2007
Draft Due to External Reviewer	August 2007
Final Report Due	October 2007

Project Laboratory Costs

Table 2 provides a breakdown of the estimated analytical costs for this project. This estimate is based on a one-time-sampling of 30 wells, which includes three sets of field duplicate samples (10% duplicate rate) and one method blank. The total laboratory budget for the project is $10,000. There is enough buffer in the budget to allow for an additional four samples to accommodate unanticipated sampling issues. The reported analytical costs reflect Manchester Environmental Laboratory's (MEL) 50% discounted price for pre-planned sample submittals.

Table 2. Estimated Analytical Cost.

Parameter	Number of Samples	Cost per Sample	Total Cost per Parameter
Ethylene Dibromide	34	$100	$3,400
1,2- dichloropropane	34	$150	$5,100
Nitrate + Nitrite (N)	34	$12	$408
Project Costs		$262	$8,908

Quality Objectives

The measurement quality objectives (MQOs) for this project are presented in Table 3. All water quality data referenced in the final report (both new and historic) will be evaluated against the project MQOs. The total accuracy figures reflect the reported precision and bias limitations of the respective analytical methods (Ecology, 1993). Approved regulatory field methods will be used throughout this project to minimize measurement bias (systematic error) and to improve precision (random error). Standardized well purging and sampling procedures will be used to measure field parameters (see Table 3) and to minimize potential changes to water chemistry for laboratory samples. All laboratory-bound samples will be collected, preserved, stored, and otherwise managed using accepted procedures for maintaining sample integrity prior to analysis (Ecology, 1993; USGS).

The precision and bias routinely obtained by MEL for the parameters of interest to this study will be adequate.

Table 3. Measurement Quality Objectives.

Parameter	Check Standard (LCS)	Duplicate Samples	Matrix Spikes	Matrix Spike Duplicates	Lowest Concentration of Interest
	% Recovery Limits	Relative Percent Difference	% Recovery Limits	Relative Percent Difference	Units of Concentration
Field Measurements					
pH	± 0.2 pH SU	± 0.1 pH SU	NA	NA	NA
Conductivity	± 10 umhos/cm	± 10 %	NA	NA	25 umhos/cm @ 25 C
Temperature	± 0.1 C	± 5 %	NA	NA	NA
Dissolved Oxygen	± 0.2 mg/L	NA	NA	NA	0.2 mg/L
Laboratory Analyses					
Ethylene Dibromide	60-140 %	± 30 %	75%-125 %	± 30 %	0.02 ug/l
1,2-DCP	60-140 %	± 30 %	75%-125 %	± 30 %	0.25 ug/l
Nitrate-Nitrite-N	80-120%	± 15 %	75%-125 %	± 20 %	0.01 mg/l

Sampling Design

The objectives of this study will be met by sampling approximately 30 wells. These wells will be chosen based on proximity to previously defined contamination plumes, sampling history, adequacy of the well, and willingness of the owner to participate in the study. The wells will be sampled for field parameters (temperature, pH, dissolved oxygen, and conductivity) and laboratory parameters (EDB, 1,2-DCP, and nitrate). To help define the monitoring network, a pool of candidate wells will be compiled from an initial search of area well logs and prior investigative reports (O'Herron, 1999a). When screening wells, preference will be given to wells completed in the uppermost surficial aquifer, since they are the most likely to be impacted by contaminants applied at the land surface. The following criteria will be used to screen wells for follow-up field visits and possible inclusion in the study:

1. A well drillers report (well log) must be available for the well. The report must include the following minimum information: the well site address, owner name, geologic description and well construction information; and, where possible, the well ID tag number.
2. The well must be near a site previously found to contain the target analytes.
3. The well must be easily accessed for water quality sampling.
4. The current well owner must grant access to the well.
5. The well should not have a water treatment device (such as a water softener, chlorination, or iron treatment system) or an unusually large storage tank that cannot be bypassed during purging and sampling.
6. The study wells should be distributed to provide a representative coverage of the study areas.

The owners of potential candidate wells will be contacted (by mail, telephone, and/or through onsite visits) to discuss their participation in the project and to confirm that their well is suitable for monitoring. Wells selected for monitoring will be field located via handheld Global Positioning System (GPS) units and on paper orthophotos for subsequent analysis and plotting via Geographic Information System (GIS) software. The paper orthophoto locations will be used as a secondary in-office confirmation of GPS-derived well coordinates.

Sampling Procedures

Approximately 30 wells will be sampled in a one-time sampling that is a follow up to a previous study. All wells will be purged prior to sampling. Samples will only be collected from taps or hose bibs where untreated well water can be obtained. Well water will be accessed through the tap that is closest to the well head prior to receiving treatment. The well water will be routed through a clean *Y* fitting and tubing directly to a metered-closed-atmosphere flow cell, where at three-minute intervals, temperature, pH, conductivity, and dissolved oxygen will be measured and recorded. Wells will be purged until field parameters are stable according to the well purge criteria established in Table 4.

Table 4. Well Purging Criteria.

Purge Parameter	Stabilization Criteria[a]
pH	±0.2 standard unit
Temperature	±0.2 °C
Conductivity	±10 µmhos/cm for values <1000 µmhos/cm ±20 µmhos/cm for values >1000 µmhos/cm
Dissolved Oxygen	±0.3mg/L for values > 2 mg/L
Or	
All parameters	< ±10% change over 2 consecutive readings at 3 minute intervals

[a] Criteria as allowable variation between two consecutive measurements collected at 3-minute intervals.

Once purge parameters have stabilized and been recorded, water will be routed to the second outlet of the *Y* fitting for sample collection.

Upon completion of field tests, water samples will be collected in pre-cleaned analyte-specific sample containers supplied by MEL (Table 5).

The filled sample bottles will be labeled and placed in portable ice filled coolers for short-term storage prior to their arrival at MEL. The samples will be delivered to the Operations Center (OC) walk-in cooler on the final day of sampling for transport to MEL via laboratory currier.

Table 5. Container, Sample Volume, Filtration, Preservation, and Holding Time Requirements.

Analyte	Container Type	Container Volume (ml)	Preservation	Holding Time
Ethylene Dibromide	125 ml VOA (2 vials)	125 ml		14 days
1,2- dichloropropane	40 ml VOA (2 vials)	40 ml		14 days
Nitrate+Nitrite-N	w/m clear Nalgene (pre-acidified)	125	Adjust pH to <2 w/ H_2SO_4 and cool to <4°C	28 days

Measurement Procedures

This study will employ both field and laboratory based measurements. The expected detection or reporting limits for field parameters and laboratory analyses are listed in Table 6 along with the anticipated analytical method.

Table 6. Summary of Field and Laboratory Measurements, Methods, Reporting Limits, and Expected Ranges for Groundwater Samples.

Parameter	Method	Reporting Limit	Range/ Maximum Concentration	
Field Measurements			**Bertrand**	**Meadowdale**
pH	EPA 150.1	+/- 0.1 SU	5.5 – 7.5 SU	5.5 – 7.5 SU
Conductivity	EPA 120.1	+/- 5%	100 – 1000 umhos/cm	100 – 1000 umhos/cm
Temperature		+/- 0.2 C	7 – 15 degrees C	7 – 15 degrees C
Dissolved Oxygen	EPA 360.1	+/- 0.2 mg/L	0.1 – 10 mg/l	0.1 – 10 mg/l
Laboratory Parameters			**Bertrand**	**Meadowdale**
Ethylene Dibromide	EPA 8011	0.02 ug/l	0.24 ug/L	ND
1,2-dichloropropane	EPA 8260	0.25 ug/l	15 ug/L	MCL
Nitrate+Nitrite-N	4500 NO3I	0.01 mg/l	56	14.9

* Expected range determined from prior investigation by O'Herron, 1999a.

Quality Control Procedures

Field

Water Quality Sampling

The following protocols will be adhered to during water quality sampling to maintain quality control during field sampling:

- All field meters will be calibrated in accordance with the manufacturer's instructions and according to the regulatory requirements at the beginning of the sampling day and again at midday. Only fresh commercially-prepared standards will be used for calibration.
  - The temperature probe will be calibrated against a mercury thermometer.
  - The pH probe will be calibrated with the two point method using the pH buffer solutions of 4 and 7.
  - The dissolved oxygen probe will be refitted with fresh solution and a new membrane prior to sampling, and the meter will be calibrated in saturated air.
  - Electrical conductivity will be calibrated prior to use with a 0.01 M KCl standard solution.
- All non-dedicated sampling equipment (Y-fittings and tubing connectors) will be cleaned between wells. Equipment decontamination will consist of an initial washing in a mild solution (0.02%) of phosphate-free detergent followed by a de-ionized water rinse.
- Sampling equipment and materials will be selected based on their compatibility with the parameters of interest to prevent bias in sample results.
- Sampling teams will employ a *clean hands/dirty hands* approach to sample collection. One sampler will be responsible for filling and handling the sample bottles at each site. The designated sampler will put on a pair of clean sampling gloves prior to touching and opening bottles, filters, tubing, and other equipment that could potentially come into contact with the sampled water.
- One equipment blank will be submitted to determine if sampling equipment is causing bias in the sample results. If bias is evident, additional steps will be taken to isolate and remove the source of error.
- Field duplicate samples will be collected at a minimum ratio of one duplicate for every ten samples and submitted to the laboratory blind.
- Standardized field forms will be used to track and describe all field procedures, to record field parameters and sample identification numbers, and to describe any necessary deviations from the planned purging and sampling procedure described here.

Laboratory

Manchester Environmental Laboratory's routine quality control procedures (method blanks, duplicates, matrix spikes, and check standards) will be used to demonstrate laboratory precision and accuracy. These procedures will allow the project lead to determine if the project MQO's were met. Precision can be estimated from duplicate and check standards, duplicate sample analysis, and duplicate spiked sample analyses. Bias will be estimated from matrix spikes, matrix spike duplicates, and check standards. Recoveries from check standards provide an estimate of bias due to calibration. Mean percent recoveries of spiked sample analyses provide an estimate of bias due to interference. Results of quality control analyses will be reported in the same units as expressed for the MQOs. Laboratory staff will conduct a quality assurance review of all analytical data generated at MEL prior to releasing the data to the project lead along with a standard case narrative of laboratory Quality Assurance/Quality Control results and data qualifiers, if any.

Data Management

At the completion of the sampling event, all field and laboratory analytical data will be compiled and evaluated against the project measurement quality objectives. Data reduction, review, and reporting will follow the procedures outlined in MEL's lab users manual (Washington State Department of Ecology, 2005). Lab results will be checked for questionable or missing data. Analytical precision will be evaluated using standard statistical techniques {relative percent difference (RPD), standard deviation (s), pooled standard deviation (sp), or percent relative standard deviation (%RSD)} as appropriate. The %RSD for field and laboratory duplicates will be used to assess data quality.

Data Verification and Validation

Manchester Environmental Laboratory (MEL) staff will review all laboratory analysis for the project to verify that the methods and protocols specified in the Quality Assurance (QA) Project Plan were followed; that all instrument calibrations, quality control checks, and intermediate calculations were performed appropriately; and that the final reported data are consistent, correct, and complete, with no omissions or errors (Washington State Department of Ecology, 2005). Evaluation criteria will include the acceptability of instrument calibrations, procedural blanks, spike sample analysis, precision data, laboratory control sample analysis, and the appropriateness of assigned data qualifiers, if any. MEL will prepare a written case narrative describing the results of their data review.

The project lead will review the MEL data package and case narrative to determine if the results met the MQOs for bias, precision, and accuracy for that sampling episode and to ensure that all analyses specified on the *Request for Analysis* form were performed as requested. Field duplicate results will be evaluated and compared to the quality objectives shown in Table 3. Based on these assessments, the data will either be accepted, accepted with appropriate qualifications, or rejected.

After the laboratory and field data have been reviewed and verified by the project manager, they will be transitioned (where appropriate) to Environmental Information Management System (EIM) for access by the project client and others. The EIM data sets (both field and laboratory results) will be independently reviewed for errors by another Environmental Assessment (EA) Program staff person before closing out the EIM project and setting the data validation flag to *completed*. The initial data review will consist of a 10% random sampling of the project data. If any errors are discovered during the initial data review, a full independent review will be undertaken.

Data Quality Assessment and Reporting

Once the data have been reviewed and verified, the project lead will determine if the data can be used towards the project goals and objectives. Assuming the project MQOs are ultimately met, the data will be deemed acceptable for use (except as qualified during the data review and validation process).

A draft data report will be prepared and forwarded to the client for review. The report will include the following:

- Description of the project purpose, goals, and objectives.
- Map(s) of the study area and sampling sites.
- Descriptions of field and laboratory methods.
- Discussion of data quality and the significance of any problems encountered in the analyses.
- Summary tables of field and laboratory chemical data.
- Observations regarding significant, or potentially significant, findings.
- Recommendations based on project goals.

Homeowners will be sent a copy of the well sampling results for their individual well along with an explanation of the water quality analysis.

At the completion of the project, data suitable for archiving will be transitioned to the EIM database.

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