



DEPARTMENT OF
ECOLOGY
State of Washington

Quality Assurance Project Plan

ConAgra Foods (Lamb-Weston) Pasco Hydrogeologic Review

February 2013

Publication No. 13-03-101

Publication Information

Each study conducted by the Washington State Department of Ecology (Ecology) must have an approved Quality Assurance Project Plan. The plan describes the objectives of the study and the procedures to be followed to achieve those objectives. After completing the study, Ecology will post the final report of the study to the Internet.

The plan for this study is available on Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1303101.html>

Ecology's Activity Tracker Code for this study is 12-045.

Author and Contact Information

Melanie Redding
P.O. Box 47600
Environmental Assessment Program
Washington State Department of Ecology
Olympia, WA 98504-7710

This plan was prepared by a licensed hydrogeologist. A signed and stamped copy of the report is available upon request.

For more information contact: Communications Consultant, phone 360-407-6834.

Washington State Department of Ecology - www.ecy.wa.gov/

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Yakima 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

Any use of product or firm names in this publication is for descriptive purposes only and does not imply endorsement by the author or the Department of Ecology.

If you need this document in a format for the visually impaired, call 360-407-6834.

Persons with hearing loss can call 711 for Washington Relay Service.

Persons with a speech disability can call 877- 833-6341.

Quality Assurance Project Plan

ConAgra Foods (Lamb-Weston) Pasco
Hydrogeologic Review

February 2013

Approved by:

Signature: _____ Date: February 2013
Don Nichols, Client, Water Quality Program, Eastern Regional Office

Signature: _____ Date: February 2013
Diana Washington, Client's Unit Supervisor, Water Quality Program,
Eastern Regional Office

Signature: _____ Date: December 2012
James Bellatty, Client's Section Manager, Water Quality Program,
Eastern Regional Office

Signature: _____ Date: December 2012
Melanie Redding, Author / Project Manager, EAP

Signature: _____ Date: December 2012
Tom Mackie, Author's Section Manager, EAP

Signature: _____ Date: December 2012
Bill Kammin, Ecology Quality Assurance Officer

Signatures are not available on the Internet version.
EAP: Environmental Assessment Program

Table of Contents

	<u>Page</u>
List of Figures and Tables.....	3
Abstract.....	4
Background.....	5
Organization and Schedule	7
Process Design (Experimental Design)	8
Study Objectives	8
Scope of Work	8
Quality Objectives	10
Evidence of Seasonality	10
Outliers.....	10
Normality	10
Trend Analysis	10
Data Management Procedures	11
Reports	11
Data Quality	12
References.....	13
Appendix. Glossary, Acronyms, and Abbreviations	14

List of Figures and Tables

Page

Figure

Figure 1. ConAgra sprayfield site.....6

Tables

Table 1. Organization of project staff and responsibilities.....7

Table 2. Proposed schedule for completing the final report.7

Table 3. Groundwater parameters.8

Abstract

ConAgra Foods Lamb Weston Inc.(ConAgra) in Pasco, Washington, is one of the few food processing facilities in Washington State which land-applies their process wastewater year-round for treatment. Land application of wastewater outside of the growing season has the potential to contaminate groundwater, since the crops and soil microbial community are dormant and nutrients tend to leach beyond the root zone with heavy winter precipitation.

Washington State requires that AKART (all known, available and reasonable methods of prevention, control, and treatment) must be applied to all wastewater before it can be permitted to discharge to the environment (Chapter 90.48 RCW; Chapter 173-200 WAC). AKART for industrial land treatment systems in Washington typically includes the agronomic application of wastewater and nutrients during the growing season and storage in a lined impoundment during the winter (Ecology, 2004). A facility can present to Ecology for consideration of a site-specific alternative to AKART if it can demonstrate the conditions and a wastewater management strategy of the alternate treatment system is equally protective of the environment.

Additionally, all discharges must meet surface and groundwater quality standards. If the facility's treatment of its process water results in a violation of standards, then additional treatment must be implemented to protect water quality.

The objective of this assessment is to provide a hydrogeologic evaluation of all ConAgra reports for the Pasco facility, compliance data between 2000 and 2011, and relevant literature submitted to Ecology, to provide a technically defensible AKART determination for this year-round land application site and assess impacts to groundwater quality from ConAgra wastewater management practices.

Background

ConAgra Foods Lamb Weston Inc.(ConAgra), located in Pasco, Washington, is one of the few food processing facilities in the State of Washington, which land-applies their process wastewater year-round for treatment. Land application of wastewater has the potential to contaminate groundwater if the nutrients and minerals are not used by crops in the root zone. ConAgra is located in WRIA 36 and HUC 170200160207 in Franklin County.

Washington State Department of Ecology (Ecology) guidance describes the minimum treatment technology (AKART) for land application of industrial wastewaters. It specifies that a lined lagoon is necessary to contain process wastewater generated over the winter months when crops and the soil microbial community are dormant and the agronomic application is not a viable treatment option. (This guidance also acknowledges that discharge to surface water and publicly-owned treatment works can be viable alternatives to winter storage in some instances.) Ecology allows for site-specific considerations to modify the minimum level of treatment, as long as the proposed treatment is at least as protective of the environment as AKART (Ecology, 2004).

Ecology's Water Quality Program, Eastern Regional Office, has requested a hydrogeologic review of submitted documents by ConAgra - Pasco to determine if their land treatment facility is meeting the AKART requirement and is complying with the Groundwater Quality Standards (Chapter 173-200 WAC). This assessment will include: (1) determining if the current treatment is protective of groundwater quality, (2) whether agronomic application of wastewater is occurring, and (3) whether additional treatment or winter storage is necessary to adequately protect groundwater. The elements described in the Process Design section will be used to make these determinations.

Facility Description

ConAgra owns and operates a potato processing facility in Pasco. This facility processes 800 to 1600 tons of potatoes per day, making french fries and other formed potato products. The facility has been in operation since 1967 and has never had a winter storage lagoon. The facility generates an average of 1.35 to 1.5 million gallons per day of process wastewater and land-applies year-round to 3100 acres (Figure 1). Much of the land is leased from local farmers for wastewater application. The process wastewater is treated with screens and a clarifier before it is pumped to the sprayfields where it is land-applied via center pivot spray irrigation. Typically, crops include alfalfa, corn, and winter wheat. (Peterson and Burgard, 2000; Wanta, 1995).

The facility is located in Pasco just north of the Tri-Cities Airport. Pasco, in Franklin County, (WRIA 36) is in a semi-arid region that receives less than 10 inches per year of precipitation, with evaporation at approximately 41 inches per year. The sprayfields are located within – and generally surrounded by – privately-owned, spray-irrigated agricultural lands that are part of the Columbia Basin Irrigation Project, managed by the U.S. Bureau of Reclamation. The entire Basin project occupies approximately 500,000 acres.

The facility has a State Waste Discharge Permit ST-5309, issued by the Eastern Regional Office, Water Quality Program. The permit expires in May 2013. Don Nichols, the facility permit manager, is the client for this evaluation.

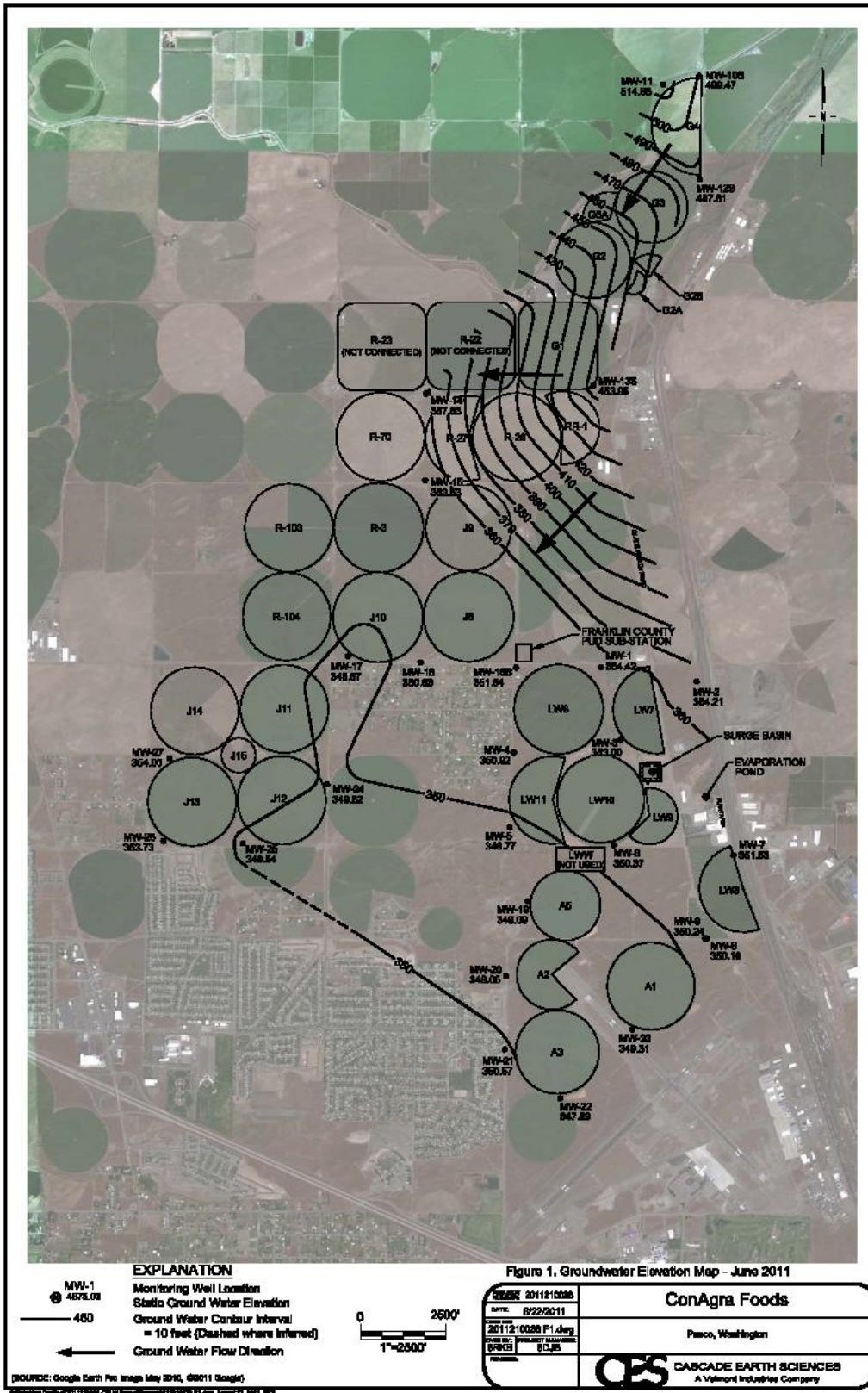


Figure 1. ConAgra sprayfield site.

Organization and Schedule

Table 1 lists the people involved in this project. All are employees of the Washington State Department of Ecology. Table 2 presents the proposed schedule for this project.

Table 1. Organization of project staff and responsibilities.

Staff (all are EAP except client)	Title	Responsibilities
Don Nichols Water Quality Program Eastern Regional Office Phone: 509-329-3524	EAP Client	Clarifies scope of the project. Provides internal review and approval of the QAPP and report.
Diana Washington, PE Water Quality Program Eastern Regional Office Phone: 509-329-3504	Client Supervisor WQP/ERO/PMU	Provides internal review and approval of the QAPP and report.
Melanie Redding Eastern Operations Section Phone: 360-407-6524	Project Manager; Principal Investigator	Writes the QAPP. Conducts review of data, analyzes and interprets data, and reviews reports. Writes the draft report and final report.
Tom Mackie Eastern Operations Section Phone: 509-457-7136	Section Manager for the Project Manager	Reviews the project scope and budget, tracks progress, and reviews and approves the QAPP and report.
William R. Kammin Phone: 360-407-6964	Ecology Quality Assurance Officer	Reviews and approves the draft QAPP and the final QAPP.

EAP: Environmental Assessment Program

QAPP: Quality Assurance Project Plan

Table 2. Proposed schedule for completing the final report.

Final Report	
Report Author Lead	Melanie Redding
Schedule:	
Report Supervisor Draft Due	May, 2013
Report Client/Peer Draft Due	June, 2013
Report External Draft Due	July, 2013
Report Final Due	September, 2013

Process Design (Experimental Design)

Study Objectives

The goal of this study is to determine whether the treatment design currently used at this ConAgra facility is equivalent to AKART and if this facility is in compliance with the groundwater quality standards. Specifically, this assessment will investigate whether year-round land application of process wastewater is equivalent to the Ecology-recommended AKART for industrial land application (agronomic application during the growing season and winter storage). The initial parameters of concern include nitrogen, total dissolved solids (fixed dissolved solids) and hydraulic loading; however, all the groundwater parameters listed in table 3 will be analyzed.

Table 3. Groundwater parameters.

Primary Parameters of Concern	Field Parameters	Other Inorganic Parameters
Nitrate	pH	Alkalinity
Total Dissolved Solids	Conductivity	Calcium
	Depth to Water	Chloride
		Magnesium
		Potassium
		Sodium
		Sulfate

The facility has been in operation since 1967, land-applying their wastewater year-round. Process improvements have been implemented over the years. Therefore, to reflect the most current conditions, only the last ten years of data will be reviewed.

Scope of Work

The tasks necessary to complete this assessment include:

- Tour facility
- Review reports submitted to Ecology
 - Permit Application
 - Engineering Report
 - Hydrogeologic Report
 - Irrigation and Crop Management Plans
- Review State Waste Discharge Permit and Fact Sheet
- Review Ecology file

- Download PARIS data
 - Each permitted facility must submit water quality compliance data to Ecology on a Discharge Monitoring Report (DMR). This data is entered into the PARIS system. PARIS is the Permit and Reporting Information System for the Water Quality Program.
 - The data for ConAgra, State Waste Discharge Permit ST-5309 will be downloaded for the effluent and groundwater quality for all monitor wells, for the years 2000 to 2011. This data will be organized in a format that will be conducive to statistical evaluation.
- Review any additional groundwater data which may be relevant and verify quality, as specified in the Data Quality section.
- Analyze data in accordance with the quality objectives, as specified in the Data Quality section.
- Review relevant literature.
- Prepare a written recommendation.
- Discuss recommendation with the ERO Water Quality Program.
- Prepare a draft report.
- Present findings to ConAgra.
- Incorporate comments into report.
- Finalize and publish report.

Quality Objectives

Each set of parameters monitored will be evaluated based on the procedures described in the Implementation Guidance for the Groundwater Quality Standards (Kimsey, 1996), or in EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (EPA, 2009).

Evidence of Seasonality

The data will be statistically evaluated to determine if there is a seasonal component to the data. If seasonality is present, then the data will be adjusted before performing trend analysis.

Outliers

An outlier is an extreme value which is not in the same distribution as the rest of the data. There are numerous reasons for outliers: an unnatural occurrence, inconsistent sampling, inconsistent analytical techniques, errors in transcription of data, or valid extreme measurements. Testing data for outliers is important to determine whether there is statistical evidence that an observation that appears to be extreme does not fit the distribution with the rest of the data.

DMR data routinely has quality assurance procedures (as specified in the Data Quality section). However, if data is determined to be an outlier, then it will be checked to determine if a transcription error has occurred by comparing the PARIS value with the value reported on the DMR. If a discrepancy is found, then the data will be corrected. If no discrepancy is found, then the value will remain in the data set (Kimsey, 1996).

Normality

The distribution for each data set will be identified. This information will determine whether data will be evaluated with a parametric or non-parametric test, and whether the data needs to be transformed (normalized).

Trend Analysis

Trend Analysis will be determined using the Mann-Kendall Test of Trends described in EPA's Unified Guidance (EPA, 2009), using Sanitas Statistical software version 9.3 (Sanitas, 2010). Trend analysis will be used to compare upgradient wells with downgradient wells. Data from the upgradient well will not be altered regardless if a significant increasing or decreasing trend is identified.

Data Management Procedures

ConAgra groundwater data will be evaluated using three primary criteria: (1) compliance with the groundwater quality standards (Chapter 173-200 WAC), (2) evidence of groundwater degradation due to ConAgra activities, and (3) determination of other potential sources of contamination.

All DMR data will be evaluated by sorting the 2000 to 2011 data by location and by parameter. The following activities will be conducted:

- Trends in the data will be determined using the Mann-Kendall test of trends, using Sanitas Statistical software.
- Groundwater quality data will be compared to the groundwater quality standards to determine violations.
- Time series graphs will be generated to assess temporal changes in the data.
- Stiff diagrams and trilinear plots will be used to graphically display water quality.
- Groundwater quality will be analyzed based on hydrogeologic characteristics to determine if there are significant differences between upgradient and downgradient monitor wells.
- If other potential sources of nitrate contamination are suspected, these will also be investigated.

Reports

A project report will present the results of the study. Consultation with the client will occur during the course of the project.

The report will undergo a technical peer review by a designated Ecology employee with appropriate qualifications. An internal Water Quality Program review and presentation by author/investigator will provide an opportunity for comments and revision to the final report.

After the internal review process, a copy of the final draft report will be provided to ConAgra, and a presentation will be made to the facility. Any relevant comments will be incorporated into the final draft, and the project report will be finalized, published, and posted to Ecology's website. Unless there is a demonstrated error by Ecology in their interpretation of the data, Ecology will not change the recommendations or conclusions of the final draft report

Data Quality

As part of the permit requirements in the State Waste Discharge Permit issued by the Water Quality Program, ConAgra was required to develop and submit a groundwater monitoring plan (Wanta, 1995). This permit directs the facility to develop their monitoring plan consistent with the Implementation Guidance for the Groundwater Quality Standards (Kimsey, 1996). Section 5.9.4 of this document describes the quality assurance requirements necessary for collecting and submitting quality data. Additionally, this document refers permittees to EAP's Guidelines and Specifications for Preparing Quality Assurance Project Plans (Lombard and Kirchmer, 2004).

A permit quality analyst in the Water Quality Program reviews all permits for consistency, legal requirements, and completeness.

ConAgra collects compliance data and submits this data to Ecology where it is entered into the PARIS (Permit and Reporting Information System) database. PARIS is maintained by Ecology's Water Quality Program. The submitted data is reviewed by the permit manager for violations and anomalies. Additionally, a regional data administrator reviews the compliance data and flags questionable values. Flagged data is sent to both the permit manager and the facility.

The Water Quality Program also conducts monthly DMR reviews for all permitted facilities.

These quality assurance procedures are designed to ensure the highest possible quality compliance data.

References

Ecology, 2004. Guidance on Land Treatment of Nutrients in Wastewater, with Emphasis on Nitrogen. Washington State Department of Ecology, Water Quality Program, Olympia, WA. 5 pgs. Publication No. 04-10-081.

<https://fortress.wa.gov/ecy/publications/SummaryPages/0410081.html>

EPA, 2009. Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Unified Guidance. Office of Solid Waste, Permits and State Programs Division, U.S. Environmental Protection Agency, Washington D.C. EPA 530/R-09-007, 888 pgs.

Kimsey, M., 1996. Implementation Guidance for the Ground Water Quality Standards, Washington State Department of Ecology, Water Quality Program, 135 pgs. Publication No. 96-02. <https://fortress.wa.gov/ecy/publications/SummaryPages/9602.html>

Lombard, S. and C. Kirchmer, 2004. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Washington State Department of Ecology, Olympia, WA. Publication No. 04-03-030.

<https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html>

Peterson, G. and D. Burgard, 2000. Process Water Land Application Engineering Report, Lamb-Weston, Inc. Pasco, Washington, Cascade Earth Sciences, 20 pgs plus figures and appendices.

Sanitas, 2010. Sanitas Statistical Software, Version 9.2, Sanitas Technologies.

WAC 173-200. Water Quality Standards for Ground Waters in the State of Washington
Washington State Department of Ecology, Olympia, WA.

www.ecy.wa.gov/laws-rules/ecywac.html

Wanta, D., 1995. Hydrogeologic Characterization, Lamb-Weston, Inc., Pasco, Washington, Cascade Earth Sciences, 20 pgs plus figures and appendices.

Appendix. Glossary, Acronyms, and Abbreviations

Glossary

Agronomic rate: The rate at which a viable crop can be maintained and there is minimal leaching of chemicals downward below the root zone. Crops should be managed for maximum nutrient uptake when used for wastewater treatment.

Ambient: Background or away from point sources of contamination.

Conductivity: A measure of water's ability to conduct an electrical current. Conductivity is related to the concentration and charge of dissolved ions in water.

Downgradient wells: Wells which measure potential impacts from a facility's discharge. These wells can be used to determine compliance with the groundwater quality standards.

Effluent: An outflowing of water from a natural body of water or from a man-made structure. For example, the treated outflow from a wastewater treatment plant.

Fixed Dissolved Solids or Total Fixed Dissolved Solids (FDS): Total Dissolved Solids are comprised of volatile and fixed solids. The volatile portion is the organic portion which includes sugars and starches. The Fixed Dissolved Solids portion is the inorganic portion which is composed primarily of the salt constituents.

Groundwater: Water in the subsurface that saturates the rocks and sediment in which it occurs. The upper surface of groundwater saturation is commonly termed the water table.

Nitrate: Nitrate is an inorganic compound composed of one atom of [nitrogen \(N\)](#) and three atoms of [oxygen \(O\)](#); the chemical symbol for nitrate is NO₃. Nitrate is the most mobile form of the nitrogen species.

Nutrient: Substance such as carbon, nitrogen, and phosphorus used by organisms to live and grow. Too many nutrients in the water can promote algal blooms and rob the water of oxygen vital to aquatic organisms.

Parameter: A physical chemical or biological property whose values determine environmental characteristics or behavior.

pH: A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is ten times more basic than one with a pH of 7.

Point of Compliance: The location where the groundwater quality enforcement limit shall not be exceeded.

Point source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than 5 acres of land.

Total Dissolved Solids (TDS): A measure of the amount of material dissolved in water (mostly inorganic salts). Typically aggregates of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, etc. of calcium, magnesium, manganese, sodium, potassium, and other cations which form salts.

Upgradient wells: Wells which are unimpacted by the facility's activities. These wells define ambient groundwater quality and are used to determine compliance with downgradient water quality data.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Acronyms and Abbreviations

AKART	All known available and reasonable methods of prevention, control, and treatment.
BMP	Best management practices
DMR	Discharge monitoring report
e.g.	For example
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HUC	Hydrologic Unit Code
PARIS	Permit and Reporting Information System database
QA	Quality assurance
RCW	Revised Code of Washington
WAC	Washington Administrative Code
WRIA	Water Resource Inventory Area