

Section 8

Glossary of Terms Used in this Document

90% confidence value

Defined in this document as 0.225 oocysts/1,000 L. The U.S. Environmental Protection Agency (EPA) selected this target concentration value and a one-sided 90% confidence level to determine the volume of water that the Portland Water Bureau (PWB) would need to sample at the raw water intake during the one-year monitoring program. Based on the EPA target concentration value of 0.225 oocysts/1,000 L, PWB had to collect 10,250 L with no oocysts detected in this volume to show with 90% confidence that the raw water concentration is below this target concentration value.

Analyte

The chemical or microbiological constituent that is measured by an analytical method. The analytes in EPA Method 1623 are the protozoan parasites *Cryptosporidium* and *Giardia*.

Bin

A term for any of the four treatment classification categories given in the LT2 rule, which determines the degree of additional *Cryptosporidium* treatment, if any, a filtered water system must provide. For large systems, bin classifications are based on the system's average *Cryptosporidium* concentration after completing 24 months of source water monitoring.

Bull Run Watershed Management Unit (BRWMU)

The federally protected legal boundary around the Bull Run watershed; the 147-square-mile BRWMU includes land that surrounds the water supply drainage boundary.

Catchment

Synonymous with watershed; an area of land that drains to a common waterway. This term is used in reference to the Pathogen Catchment Budget Model.

Cryptosporidiosis

An infection (caused by some species of the protozoan *Cryptosporidium*) of the gastrointestinal tracts of humans and other vertebrates. The primary symptom is diarrhea with abdominal cramping, but infection is often asymptomatic.

<i>Cryptosporidium</i>	A protozoan parasite that may contaminate surface water through fecal sources such as livestock, wastewater treatment plant discharge, and wildlife. <i>Cryptosporidium</i> oocysts are resistant to chlorine disinfection.
Cyst	A phase or form of an organism produced either in response to environmental conditions or as a normal part of the life cycle of an organism (e.g. a <i>Giardia</i> cyst). It is characterized by a thick and environmentally resistant cell wall.
Discretionary event samples	Non-scheduled samples collected as part of PWB’s upstream sampling program in response to moderate events that met the intent of triggered event samples but did not exceed the pre-determined thresholds.
Drawdown areas	Areas where annual vegetation becomes established when the Bull Run reservoir banks are exposed due to lower surface water elevations of the reservoirs. PWB upstream sampling Sites 8 and 9 are located near summer drawdown areas.
Envirochek HV™	A sampling capsule and filter validated for use with 50-L sample volumes under EPA Method 1623.
EPA Method 1622	EPA Method 1622, validated in 1999, is the stand-alone <i>Cryptosporidium</i> -only predecessor to EPA Method 1623. Method 1623 incorporated the simultaneous detection of <i>Cryptosporidium</i> and <i>Giardia</i> .
EPA Method 1622/23	Refers to EPA Method 1622 or EPA Method 1623. Method 1622 tests only for <i>Cryptosporidium</i> , while Method 1623 tests for both <i>Cryptosporidium</i> and <i>Giardia</i> . Both methodologies were developed by EPA to assess the occurrence of <i>Cryptosporidium</i> (and <i>Giardia</i>) in water. Analytical steps include concentration, immunomagnetic separation (IMS), and immunofluorescence assay (FA). Monitoring under the LT2 rule must be done using Method 1622/23.
EPA Method 1623	An analytical method developed by EPA and revised in December 2005 for the detection of <i>Cryptosporidium</i> and <i>Giardia</i> in water to meet the survey and monitoring requirements of the EPA.

<i>Escherichia coli (E. coli)</i>	A gram-negative rod-shaped bacterium that is commonly found in the lower intestine of warm-blooded organisms. It is often used as an indicator of fecal contamination in water samples.
Event sampling	Sampling designed to capture the environmental conditions most likely to mobilize <i>Cryptosporidium</i> . PWB's event sampling program at upstream watershed locations was made up of triggered event sampling, discretionary event sampling, and intensive event sampling.
Event sampling trigger	A pre-determined event threshold (i.e., high stream flow, high intake turbidity, and first-flush conditions at the drawdown areas) that triggers the collection of event samples at PWB's designated upstream watershed locations during the one-year monitoring period.
Field sample	A standard environmental sample collected as part of a monitoring program.
First flush	The first significant increase in stream flow into the reservoirs after an extended dry period.
Genotype	The genetic makeup, as distinguished from the physical appearance, of an organism or group of organisms. In reference to <i>Cryptosporidium</i> , a genotype is a partial and temporary descriptor for an isolate for which significant genetic differences have been identified but all the criteria for designating a new species have not yet been met.
<i>Giardia</i>	A protozoan parasite that may contaminate surface water through fecal sources such as livestock, wastewater treatment plant discharge and wildlife. <i>Giardia</i> cysts are inactivated by chlorine disinfection.
Grandfathered data	Data collected prior to the LT2 rule's required monitoring period that meets all LT2 compliance monitoring requirements for data collection and data quality.

Headworks	The Portland Water Bureau facility at which water from the Bull Run watershed is treated with chlorine and diverted to Portland’s water supply system.
Infiltration capacity of soils	The maximum rate that water can enter soil.
Information Collection Rule Protozoan Method (ICR Method)	An older method used in the 1990s for assessing the occurrence of <i>Cryptosporidium</i> . EPA concluded that the ICR Method was adequate for making national occurrence estimates in the ICR survey but would not suffice for making estimates of <i>Cryptosporidium</i> levels at specific surface water sources for the purposes of treatment binning under LT2. EPA Method 1623 is regarded as a significant improvement over the ICR method.
Intake	The location where water is diverted from a surface water source into a water supply system. The sampling point at the intake represents raw water entering the Portland water supply system prior to any chemical treatment. During PWB’s one-year intensive monitoring for <i>Cryptosporidium</i> , 10,271 liters (449 samples) were collected and analyzed from the intake.
Intensive event samples	Additional samples that were collected at frequent intervals during significant fall and winter storms. This sampling occurred at the North Fork (Site 2) and South Fork (Site 3) of the Bull Run River as part of the upstream monitoring program.
Interim monitoring	PWB’s <i>Cryptosporidium</i> monitoring period between the end of the official study period and the conclusion of the variance request process and determination. Interim monitoring began on December 7, 2010, at the raw water intake and December 15, 2010, at the upstream watershed locations. Interim data through April 30, 2011, are summarized in this document.
Key Station	Any of the four PWB Bull Run stream sampling stations, located at U.S. Geological Survey gaging stations, where autosamplers regularly collect flow-weighted water quality samples. These four tributary sites were selected for upstream monitoring and are the main stem of the Bull Run River (Site 1), North Fork Bull Run River (Site 2), South Fork Bull Run River (Site 3), and Fir Creek (Site 4).

Laboratory QA Program	EPA's Laboratory Quality Assurance Evaluation Program for Analysis of <i>Cryptosporidium</i> in Water is an approval program through which EPA certifies laboratories in their competency to reliably measure <i>Cryptosporidium</i> in surface water using EPA Method 1622/23.
Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule)	The federal regulation designed to reduce disease incidence associated with <i>Cryptosporidium</i> and other disease-causing microorganisms in drinking water.
LT2-compliant methodology	Sampling methodology that follows all requirements of the LT2 rule. This includes using an EPA-approved laboratory, setting an official sampling schedule, and following EPA Method 1622/23 and all required quality assurance and quality control (QA/QC) procedures.
Major reservoir tributaries	Upstream sampling sites including the main stem of the Bull Run River (Site 1), the North Fork Bull Run River (Site 2), the South Fork Bull Run River (Site 3), and Fir Creek (Site 4). These four tributaries drain a total of over 80 percent of the watershed.
Matrix	Refers to the components (e.g. water, soil, feces) of a sample other than the analyte. The matrix can have an effect on the way the analysis is conducted and the quality of the results obtained; such effects are called matrix effects.
Matrix spike (MS)	A sample prepared by adding a known quantity of the chemical or microbiological analyte of interest (e.g., <i>Cryptosporidium</i> oocysts) to a specified amount of sample matrix. A matrix spike is used to determine the effect of the matrix on a method's recovery efficiency.
Method 1623 modification	A modified version of EPA Method 1623. A laboratory is permitted to modify certain method procedures to improve recovery or lower the costs of measurements, provided that all required quality control (QC) tests are performed and all QC acceptance criteria are met.

Non-event scheduled samples	Samples collected on a pre-scheduled basis that did not meet the conditions for a triggered event sample as part of PWB’s upstream monitoring program.
One-year monitoring program	The official one-year intensive monitoring program developed in cooperation with EPA in support of a variance request. The sampling that was part of this program occurred between December 14, 2009, and December 14, 2010.
Ongoing Precision and Recovery (OPR) standard	A method blank spiked with known quantities of analytes (i.e. positive control sample; laboratory control sample). The OPR is analyzed in the same way as a field sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in Method 1622/23 for precision and recovery. The laboratory must analyze one OPR sample each week, or one for every 20 field samples, if more than 20 field samples are analyzed in a week.
Oocyst	The encysted zygote of some sporozoa; e.g., <i>Cryptosporidium</i> . The oocyst is a phase or form of the organism produced as a normal part of the life cycle of the organism. It is characterized by a thick and environmentally resistant outer wall and is resistant to chlorine disinfection.
Pathogen Catchment Budget Model (PCB)	A process-based mathematical model that was designed to predict pathogen budgets for the drinking water source watersheds of Sydney, Australia. EPA recommended that PWB adapt this model to the Bull Run watershed.
Performance Based Measurement System (PBMS)	As defined by the EPA, “a set of processes wherein the data needs, mandates, or limitations of a program or project are specified, and serve as criteria for selecting appropriate methods to meet those needs in a cost-effective manner.” This approach allows analytical methods (such as EPA Method 1622/23) to be modified and validated to improve performance.
Poisson distribution	A discrete frequency distribution that gives the probability of a number of independent events occurring in a fixed time. This distribution is commonly used for EPA modeling and risk assessments for <i>Cryptosporidium</i> .

Potential “hot spots”	EPA’s term for locations where <i>Cryptosporidium</i> contamination would be likely to occur. EPA categorized these locations as “near the inlets of major stream flows from migratory areas within the watershed, ‘draw down’ areas around the reservoirs where wildlife graze during the summer months...and from deeper areas in the reservoirs.”
Primacy	Status granted to a state by EPA to receive primary implementation and enforcement authority of federal primary drinking water regulations, such as the LT2 rule. Interim primacy refers to temporary status granted to a state by the EPA while the primacy application is under review.
Quality Assurance / Quality Control (QA/QC)	A set of procedures used to ensure the quality of laboratory results.
Recovery efficiency	The ratio of recovered oocysts compared to the original quantity within a matrix spike sample.
Sampling Plan and Study	The official May 2010 document Revised Sampling Plan and Study in Support of a Variance Application to the Treatment Requirements of the Long Term 2 Enhanced Surface Water Treatment Rule that describes PWB’s one-year monitoring program developed in cooperation with EPA for support of the variance request.
Species	A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding. The species is the principal natural taxonomic unit, ranking below a genus and denoted by a Latin binomial, e.g., <i>Cryptosporidium parvum</i> . In reference to <i>Cryptosporidium</i> , a species represents an isolate that has been shown to be genetically different and for which all of the criteria required for naming a new species have been met.
Statistical confidence	The degree, based on an established probability (e.g., 90%), to which an observed result or relationship is accurately estimated.

Statistically significant	Establishes that an observed mean is different (less or greater) than a target value at a specified level of confidence. In this report the level of confidence is 90% and the target value is 0.225 oocysts/1,000 L as specified by EPA.
Tier 1 validation	The equivalency demonstration requirements for method modifications at a single laboratory. Each time a modification is made to EPA Method 1622/23, the laboratory is required to demonstrate acceptable modified method performance through the initial precision and recovery (IPR) test. IPR results must meet the quality control acceptance criteria and should be comparable to previous results using the unmodified procedure.
Triggered event samples	Samples collected after the pre-determined event thresholds were exceeded as part of the PWB's upstream sampling program.
Turbidity	A regulated drinking water quality parameter measuring the degree to which the intensity of light passing through a water sample is reduced by suspended solids. Turbidity is measured in nephelometric turbidity units (NTU). To maintain an unfiltered drinking water system, turbidity levels cannot exceed 5 NTU prior to the first point of disinfectant application.
Ultra-violet (UV) light disinfection	A process for inactivating microorganisms by irradiating them with ultraviolet light. The UV waves disrupt the metabolic activities of the organisms, rendering them inactive and incapable of reproduction. UV disinfection is a form of water treatment that may be used to comply with the LT2 rule <i>Cryptosporidium</i> treatment requirements.
Upstream locations	A group of nine sampling locations upstream from the raw water intake. The locations chosen were hypothesized to have the highest risk for <i>Cryptosporidium</i> entering the surface water, i.e., potential "hot spots."

“Worst-case” conditions

Environmental conditions for which there is increased likelihood for the mobilization of *Cryptosporidium* to the source water. This can be due to heavy storms and precipitation that lead to high stream flow and increased turbidity. The event monitoring program recommended by EPA was designed to collect samples representative of “worst-case” conditions.
