Appendix C

Assessment Methodology and Standards for Protection of the Public Drinking Water Supply Beneficial Use

State of Ohio
Environmental Protection Agency

Division of Drinking and Ground Waters

Assessment Methodology and Standards for Protection of the Public Drinking Water Supply Beneficial Use

DRAFT

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Public Drinking Water Supply Beneficial Use
Executive Summary

Assessment Strategy and Objectives. The primary objective for assessing the Public Drinking Water Supply beneficial use is to fulfill the Clean Water Act (CWA) requirements and identify areas and specific causes of impairment. This program provides the State an opportunity to strengthen the connection between Clean Water Act and Safe Drinking Water Act (SDWA) activities by employing the authority of the CWA to meet SDWA objectives of source water protection and reduced risk to human health.

Utilizing a tiered assessment approach will enable Ohio EPA to focus initial assessment efforts and limited resources on water bodies currently serving as public drinking water sources. The first round of assessments will focus on indicators with established water quality criteria, while later assessments will incorporate additional indicators as related criteria are finalized. Initial assessments will target watersheds with known source water quality impacts and coordinate with the Total Maximum Daily Load (TMDL) assessment schedule. Data and information gathered during the initial round of assessments will assist in refinement of the assessment process and guide future source water sampling designs and assessment planning.

Water Quality Standards. As specified in Ohio regulation, OAC Chapter 3745-1, water quality standards were designed to protect source water quality to the extent that public water systems can meet the finished water SDWA standards utilizing only conventional treatment. Source water quality will be assessed though comparison of in-stream and applicable treated water quality data to numeric chemical water quality criteria for the core indicators; nitrate, pesticides, and other contaminants and *Cryptosporidium* (following criteria development). The numeric water quality criteria correspond to the treatment standards established by the SDWA or were adopted from U.S. EPA—304(a) recommended water quality criteria. Criteria will apply as average concentrations except for nitrate. At elevated levels, nitrate can cause acute health effects and the SDWA finished water standard applies as a maximum concentration not to be exceeded. Consequently, the water quality criteria for nitrate will be applied as a maximum value. Algae and taste and odor will also be considered as supplemental indicators and assessed if there are known source water quality problems. If areas of nuisance algae are present and impacting the water treatment system, then the waters may be designated impaired due to the aesthetic narrative criteria described in OAC rule 3745-1-07.

Attainment Determination. Each assessment will result in identification of one of three attainment categories: Impaired, Full Attainment, and Not Assessed-Insufficient Data. Full attainment waters will further be evaluated for water quality conditions placing it on a ˜watch list™. Waters in this category will be targeted for increased monitoring and assessment. The following table identifies impaired and ˜watch list™ water quality conditions.

Public Drinking Water Supply Impairment Determination *Applies to in-stream ambient and treated water quality data for the most recent five year period.*	
Indicator	**Impaired Conditions**
Nitrate	❑ Two or more excursions[1] above the WQ criteria within the 5 year period
Pesticides	❑ Annual average exceeds WQ criteria
Other Contaminants	❑ Annual average exceeds WQ criteria
Cryptosporidium	❑ Annual average exceeds WQ criteria (1.0 oocysts/L*)*
Indicator	**Full Attainment Conditions**
Nitrate	❑ No more than one excursion[1] above the WQ criteria within the 5 year period.
Pesticides	❑ Annual average does not exceed the WQ criteria
Other Contaminants	❑ Annual average does not exceed the WQ criteria
Cryptosporidium	❑ Annual average does not exceed the WQ criterion
Indicator	**"Watch List" Conditions** *Source waters targeted for additional monitoring and assessment*
Nitrate	❑ Maximum instantaneous value > 8 mg/L (80% of WQ criterion)
Pesticides	❑ Running quarterly average $\geq$ WQ criteria ❑ Maximum instantaneous value $\geq$ 4x WQ criteria
Other Contaminants	❑ Maximum instantaneous value $\geq$ WQ criteria
Cryptosporidium	❑ Annual average $\geq$ 0.075 oocysts/L

[1] Excursions must be at least 30 days apart in order to capture separate or extended source water quality events.

WQ Criteria - Water Quality Criteria defined in OAC Chapter 3745-1 established to protect in-stream water quality for the PDWS beneficial use (Human health- Drinking Water)

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NOTICE TO REVIEWERS

It is important to note that revisions to Ohio ~~s~~ water quality standards will be necessary in order to fully implement the assessment methodology presented herein. Upon finalization of this methodology, assessment of the public water supply will be completed using all current water quality standards. As Ohio water quality standards are revised additional components of the methodology will be implemented.

Ohio EPA welcomes public comment on all aspects of the methodology. It should be clarified that any references to proposed new or revised Ohio water quality criteria are based on the assumption that future changes to Ohio water quality standards will incorporate the proposed criteria. Any changes to Ohio water quality standards codified in OAC Chapter 3745-1 will require a separate public notification and comment period.

Please submit all formal comments according to directions provided with the 2006 Integrated Water Quality Report. Questions or requests for clarification may be submitted to:

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Copies of this document and 2006 Ohio Integrated Water Quality Report are available from:

http://www.epa.state.oh.us/dsw/document_index/305b.html
Division of Surface Water, Central Office
Lazarus Government Center
122 South Front St., Columbus OH 43215
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INTRODUCTION AND BACKGROUND

Each year Ohio—s publiwater systems are faced with rising treatment costs driven by regulatory changes, emerging contaminants, non-point source pollution, urbanization and associated storm water quantity and quality impacts. Assessment and protection of drinking water sources is the first step of the Safe Drinking Water Act-s multiple barrier approach toward safeguarding the public health. The Clean Water Act calls for the states to maintain, restore and protect the water resources to the extent the waters meet their intended beneficial uses, including the public drinking water supply. Development of a program to assess the Public Water Supply beneficial use, herein referred to as the Public Drinking Water Supply (PDWS) beneficial use, presents a unique opportunity to coordinate efforts of two key programs to achieve common goals of source water assessment and protection.

In 2002, Ohio EPA initiated development of an assessment methodology for the PDWS beneficial use required under Section 305(b) of the Clean Water Act. Previously, it was believed that application of aquatic life and human health water quality criteria and assessment of the aquatic life beneficial uses were comprehensive enough to protect the PDWS beneficial use. However, several water bodies in Ohio were identified where the aquatic life use assessment failed to identify potentially impaired source water conditions which required additional treatment beyond conventional and expenditures by the public water system. Development of a PDWS beneficial use assessment methodology will produce a more comprehensive and accurate evaluation of public water system-s source waters, focus funding and public attention on critical areas of non-attainment, and lead to reduced human health risk and treatment costs for communities. This approach maximizes protection efforts by employing the authority of the Clean Water Act to prevent contamination of source waters while minimizing the risk to human health and violations of the human health standards set forth in the Safe Drinking Water Act (SDWA).

Ohio EPA convened a workgroup consisting of members from the Division of Drinking and Ground Waters and the Division of Surface Water to develop this assessment methodology. Ohio-s PDWS water quality standards (OAC Chapter 3745-1) were designed to assure that public water systems using conventional treatment will meet the finished water standards established by the Safe Drinking Water Act. Conventional treatment includes conventional filtration and disinfection. Conventional filtration treatment as defined in Ohio Administrative Code (OAC) rule 3745-81-01, Primary Drinking Water Rules, means a series of processes including coagulation, flocculation, sedimentation, and filtration resulting in substantial removal of particles.

The assessment methodology was developed to be consistent with key elements of the State-s existing water quality standards and monitoring strategy (designated uses, narrative and numeric criteria, antidegradation and water quality standards implementation procedures). Surface water quality criteria (human health) for the Lake Erie and Ohio River drainage basins are defined in OAC rules 3745-1-33 and 34 and other human health criteria have been developed and implemented using the methodology in OAC rule 3745-1-38. Ohio EPA is working to assure consistency between the surface water quality standards and the SDWA Maximum Contaminant Levels (MCLs) where practicable. These human health-based standards are the most comprehensive available, established by the U.S. EPA and represent the public water system treatment standards. Some surface water quality standards may remain more stringent than SDWA standards due to Great Lakes agreements, specific Lake Erie concerns and Clean Water Act requirements.

Other States Review

As background for development of Ohio-s methodology, other states were contacted to determine how they assess the drinking water use in their Clean Water Act Section 305(b) reports. Ohio EPA

reviewed other states—305(b) reports and contacted corresponding agency representatives to determine how the states were assessing the public drinking water supply use. In October 2002, Ohio EPA compiled the report ˜State Assessment Methodologies for the Drinking Water Use Designation in Surface Water Systems.™Results of the survey indicated that out of the 50 states, ten states, including Ohio, were not currently assessing the drinking water use in their 305(b) reports.

PROGRAM OBJECTIVES AND STRATEGY

The primary objective for assessing the Public Drinking Water Supply Beneficial Use is to fulfill the Clean Water Act requirements and identify areas and specific causes of impairment. Assessments will provide the State, communities, and local watershed groups valuable information that will assist in watershed planning and protection efforts. Source water quality data compiled for these assessments may also be utilized for contaminant trend analysis and evaluation of ongoing watershed restoration activities, such as effectiveness of non-point source best management practices (BMPs).

Utilizing a tiered assessment approach will enable Ohio EPA to focus initial assessment efforts and limited resources on water bodies currently serving as public drinking water sources. The first round of assessments will focus on indicators with established water quality criteria, while later assessments will incorporate additional indicators as related criteria are finalized. Initial assessments will target watersheds with known source water quality impacts and coordinate with the Total Maximum Daily Load (TMDL) assessment schedule. Data and information gathered during the initial round of assessments will assist in refinement of the assessment process and guide future source water sampling designs and assessment planning. Assessments for these waters designated with the PDWS use but not currently used as a drinking water source are considered a lower priority and will likely be assessed only when water quality data is available.

PUBLIC DRINKING WATER SUPPLY BENEFICIAL USE AREAS

Beneficial Use Designation

The Public Drinking Water Supply Use designation is defined in paragraph (B)(3) of OAC rule 3745-1-07 and is provided below. Attainment determinations will apply to hydrologic assessment units as defined by the Division of Surface Water. For inland rivers the assessment unit is defined as the 11-digit hydrologic unit code (HUC-11) or the large river assessment unit. Lake Erie beneficial use assessments apply to the corresponding basin assessment unit. As of October 2005, there were over 130 active public water systems with surface water intakes located in 98 hydrologic assessment units (HUC-11 watersheds), all three Lake Erie assessment units and eight large river assessment units.

To identify designated areas, active public drinking water intake locations were mapped along with the HUC-11 boundaries and large river assessment units as shown in Figure 1. Assessments will focus on active public drinking water supply intakes although the use designation applies to other water bodies as defined below.

Public Drinking Water Use Designation - According to paragraph (B)(3) of OAC rule 3745-1-07, Water Supply

(a) ˜Public™ these are waters that, with conventional treatment, will be suitable for human intake and meet federal regulations for drinking water. Criteria associated with this use designation apply within five hundred yards of surface water intakes. Although not necessarily included in rules 3745-1-08 to 3745-1-30 of the Administrative Code, the bodies of water with one or more of the following characteristics are designated pubic water supply:

(i) All publicly owned lakes and reservoirs, with the exception of Piedmont reservoir;

(ii) All privately owned lakes and reservoirs used as a source of public drinking water;

(iii) All surface waters within five hundred yards of an existing public water supply surface water intake;

(iv) All surface waters used as emergency water supplies.

Application of Impairment Determination

Although this beneficial use designation applies to a 500 yard zone surrounding the intakes, the attainment determination will be associated with the corresponding hydrologic assessment unit and factor into the 303(d) priority listing determination for impaired waters. For public water systems with intakes located in multiple watersheds or hydrologic assessment units, separate assessments will be completed for each intake. Attainment determinations for assessment units with multiple PDWS zones will be based on the lowest attainment categorization.

Ohio River Assessments

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency created in 1948 to control and abate pollution in the Ohio River Basin. ORSANCO operates programs to monitor, assess and improve water quality within the basin. ORSANCO has and will continue to perform evaluations of the PDWS use for Ohio River intakes with the findings presented in the Biennial Assessment of Ohio River Water Quality Conditions Report. Consequently, Ohio EPA will not assess the PDWS use for intakes located on the Ohio River main stem. ORSANCO ~~s~~ water quality standards are available at the commission ~~s~~ website http://www.orsanco.org.

Appendix A contains a summary table of the current water quality criteria for the protection of the PDWS beneficial use in the Lake Erie basin, Ohio River basin, and ORSANCO ~~s~~ Ohio River criteria.

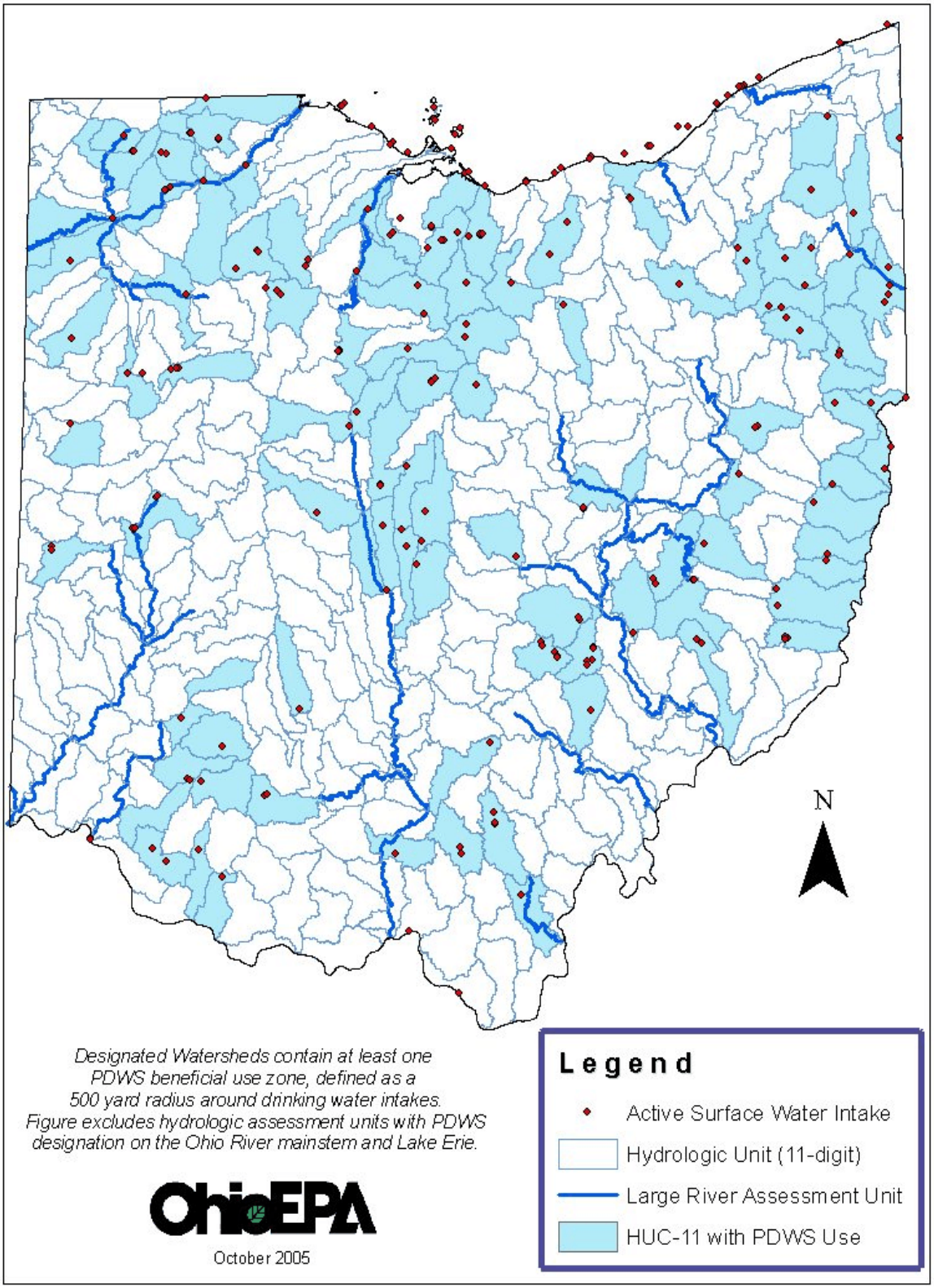

Figure 1 – Ohio Hydrologic Assessment Units with Active Public Water System Surface Water Intakes

WATER QUALITY INDICATORS

Core Water Quality Indicators

A large number of chemical and physical parameters were considered during development of the assessment methodology. At this time Ohio will focus assessments on several core water quality indicators; nitrate, pesticides, other contaminants with established water quality criteria, and *Cryptosporidium*. Selection was based on documented or suspected human health impacts, availability of established water quality standards, availability of reliable data, impact of the indicator on water treatment processes and costs, and the ability of Ohio EPA to conduct future sampling.

Nitrate

Nitrate is one of the most commonly detected chemical contaminants in surface waters used by Ohio—public water systems. Both acute and chronic health affects have been documented for elevated nitrate concentrations. Nitrate is considered an acute toxin to infants under six months and can be fatal at elevated levels (blue-baby syndrome) (2002 Ohio EPA Nitrate Fact Sheet). Additionally, conventional treatment is not effective at nitrate removal and additional treatment typically requires large expenditures by the public water system. Major sources of nitrate contamination include fertilizer from agricultural runoff or animal wastes, faulty septic systems, and municipal and industrial wastewater discharges. Public water systems can utilize additional treatment processes such as reverse osmosis, ion exchange, distillation or electrodialysis to reduce nitrate levels, but these options are not practical for many systems and exceed conventional treatment requirements. The following figure shows the cyclical nature of nitrate concentrations in finished water at Ohio surface water public water systems. Note the frequency of detections above 10 mg/L.

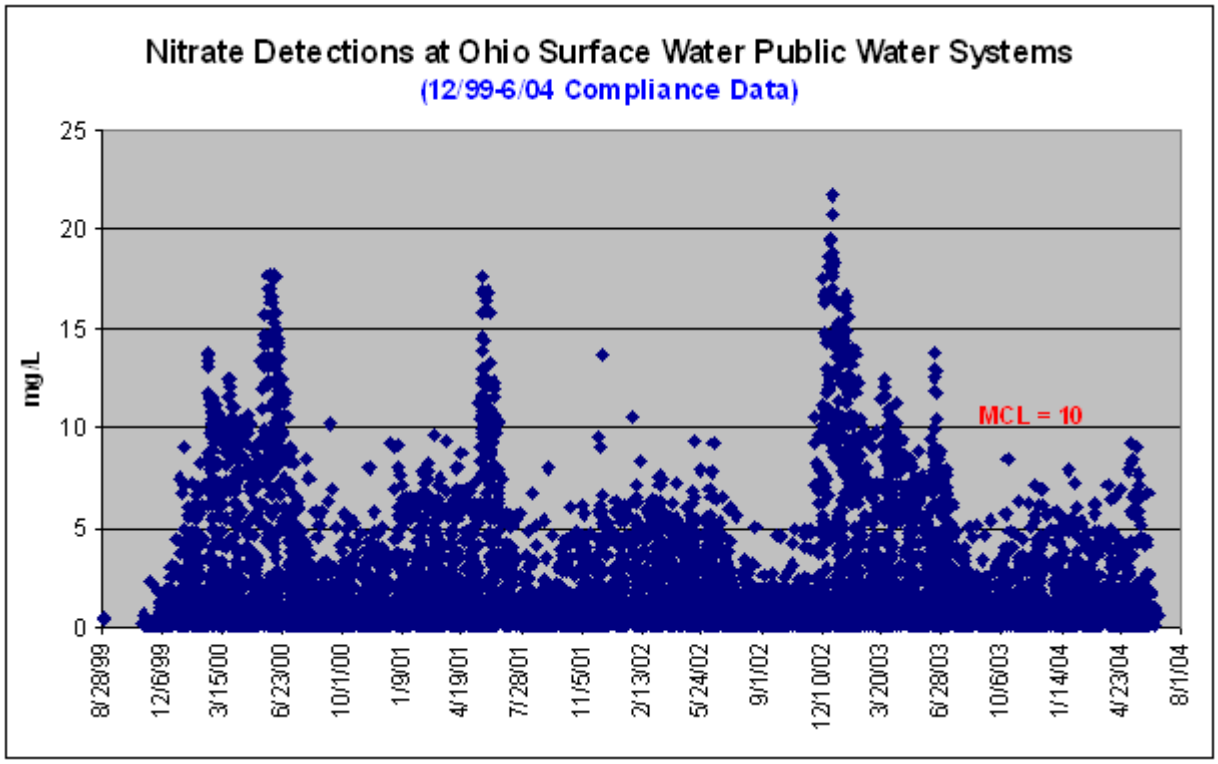

Figure 2

Pesticides

Ohio EPA conducted a four year study (1995-1999) of commonly used pesticides to document the occurrence rate in Ohio public water system finished water. Results of the study indicate that although no water systems incurred pesticide MCL violations, several systems have experienced elevated pesticide levels with significant short-term spikes well above the MCL. PDWS assessments will focus on the most frequently occurring regulated pesticides. Atrazine and simazine are the most commonly detected pesticides in treated drinking water in Ohio with peak concentrations typically occurring between April to August.

Violation of the pesticide MCL is based on the running annual average, calculated by summing the four most recent quarterly averages and dividing by four. While elevated pesticide levels above individual MCL standards occur seasonally in Ohio surface waters, there is a low occurrence of SDWA MCL violations due to the annual running average calculation used to evaluate against the standard (short term spikes are minimized by low levels in the off-season). Many Ohio public water systems provide additional carbon treatment to reduce pesticide levels during the seasonal periods and ensure compliance with finished water quality standards. For the five year period (2000-2004) there were no SDWA MCL violations issued to Ohio public water systems for pesticides. The following figure shows the occurrence of atrazine in finished water at Ohio surface water public water systems.

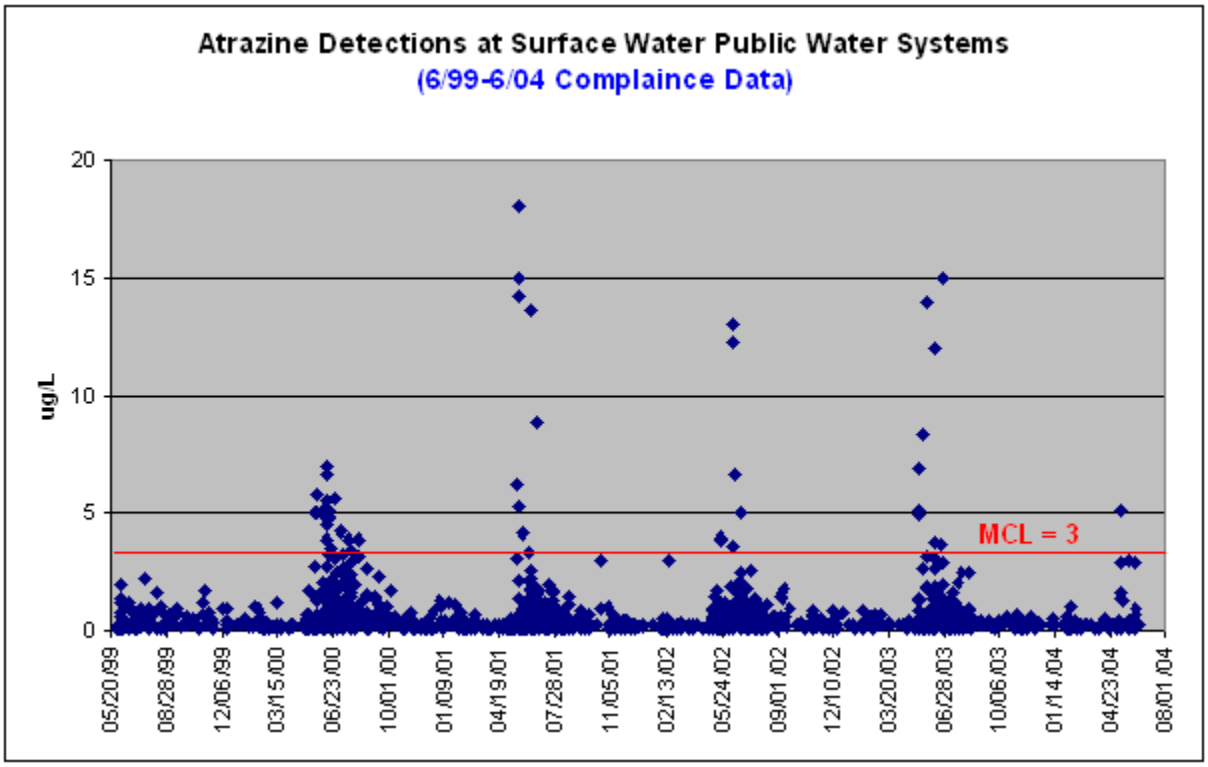

Figure 3

Other Contaminants

This indicator was developed for other contaminants regulated under the Safe Drinking Water Act with established MCLs and surface water chemical criteria. Only contaminants which can be related to source water will be assessed for PDWS use attainment determinations and contaminants created during the treatment process (such as disinfection by-products) will not be considered. Most of the contaminants included in this category are effectively removed by

conventional treatment if source water levels are not extreme. For example, increased levels of iron and manganese in the source water typically require an increase treatment, and if not effectively removed commonly cause staining and deposition problems. Elevated levels of arsenic and other contaminants may lead to increased human health risk. Source water precursors for disinfection by-products (DBPs) are under evaluation for future inclusion in the PDWS use assessments.

Cryptosporidium

Cryptosporidium, a microbial pathogen, was selected as an indicator due to the extreme health risk it presents in drinking water and the high costs associated with treatment. Ohio does not have an established water quality criteria for *Cryptosporidium* at this time, but intends to develop a criteria. Assessments will utilize future water quality sampling required by U.S. EPA ~~s~~ Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The rule will require most water systems serving populations greater than 10,000 to conduct *Cryptosporidium* sampling of their raw source water. Smaller systems serving populations less than 10,000 will conduct *Cryptosporidium* sampling only if an initial *E. coli* sampling round triggers additional *Cryptosporidium* sampling. Based on a preliminary review of existing *E. coli* data for Ohio streams and the currently proposed trigger points (10 *E. coli*/100 mL for lakes or reservoirs sources and 50 *E. coli*/100 mL for flowing stream sources), most if not all of these systems will be required to conduct future *Cryptosporidium* sampling.

Supplemental Water Quality Indicators

Several supplemental water quality indicators have been identified which may be evaluated for some PDWS use assessments. Although assessments will not focus on these indicators, if there are known water quality problems related to one of the supplemental indicators, then all available data will be reviewed.

Algae

While not directly regulated by the SDWA, the presence of algae in the source water can create large quantities of organic matter, increase turbidity, impart adverse taste and odor, and physically impact the water treatment processes by clogging filters. Algal growths in public water supply streams, lakes or reservoirs at levels which impact the treatment plant processes or require additional chemical treatment of the source water are indicative of a source water impairment. This condition may also indicate an exceedance of the statewide water quality criteria for the protection against adverse aesthetic conditions (OAC rule 3745-1-07, Table 7-11) for water used by a public water supply. If a water treatment plant has taste and odor problems and nuisance growths of algae, weeds, and slimes are present, then upstream phosphorus discharges from point sources may be limited according to rule. Information documenting algae problems will be obtained during interviews with the public water systems. Ohio EPA is currently collecting chlorophyll data from public water supply source waters in order investigate the link between algae blooms and PWS operational issues such as additional treatment costs.

Taste and Odor

The statewide water quality criteria for protection against adverse aesthetic conditions already contains a standard for two phenolic chemicals (2-chlorophenol and 2,4-dichlorophenol) which commonly cause taste and odor problems. These drinking water criteria are based on the protection against organoleptic (taste and odor) effects. No additional taste and odor criteria will be established at this time, although additional information on the occurrence and suspected cause of taste and odor problems will be documented during interviews with the public water systems.

Indicators for Future Consideration
Other water quality parameters were identified that may be useful in evaluation of the PDWS beneficial use but were not included in the assessment methodology at this time due to a lack of data regarding potential human health impacts, no established water quality criteria and lack of documented presence in source waters. Water quality indicators considered but not included in the current assessment methodology include total organic carbon, turbidity and sediment, toxic cyanobacteria (blue-green algae), and pharmaceutical compounds such as endocrine disrupters and antibiotics. These parameters will be reevaluated in the future and WQ criteria added if deemed appropriate.

Although conventional treatment can be expected to effectively remove a significant amount of sediment in the source water there may exist water quality conditions which require the water treatment plant to utilize additional processes to meet SDWA standards. Sedimentation also reduces storage capacity in public water system reservoirs and may result in costly sediment removal or loss of use. Land use changes related to urbanization and agricultural practices greatly impact water quality through increased sedimentation and degradation of storm water quality. Reduction of riparian buffer zones, hardening of land surfaces, channelization, and installation of drainage tiles have greatly reduced the ability of many watersheds to naturally regulate the quality and flow of water. Ohio EPA will continue to look at the impact of short-term turbidity fluctuations and sedimentation on water treatment plant operations in order to identify if additional water quality criteria may be required for protection of the PDWS beneficial use.

U.S. EPA continues to expand the SDWA regulated contaminant list and future revisions to Ohio—s PDWS use assessment methodology will consider any newly regulated contaminants and existing human health and source water occurrence studies.

Rationale for Indicator Exclusion
Many contaminants were excluded from the methodology based on the assumption that conventional treatment effectively removes the contaminant regardless of concentration. Other contaminants were placed in the future consideration category because water quality studies have yet to establish health effects or document their presence in source waters at levels of concern.

Giardia
The protozoan pathogen *Giardia lamblia (Giardia)* is more easily filtered than *Cryptosporidium* due to its larger diameter. *Cryptosporidium* oocysts are typically 2 to 5 microns in diameter whereas the diameter of *Giardia* ranges from 9 to 21 microns (U.S. EPA Guidance Manual for Compliance with the Interim Enhanced SWTR: Turbidity Provisions, April 1999). Additionally, new surface water treatment requirements contained in the Long Term 1 Enhanced Surface Water Treatment Rules (LT1ESWTR) specify more stringent turbidity and filtering performance standards targeted at reducing the incidence of *Cryptosporidium* in drinking water. These additional treatment requirements will also reduce exposure to other microbial pathogens such as *Giardia*.

E. coli
E. coli levels in Ohio surface waters can be very high, but conventional treatment provides an effective barrier to *E. coli* and other bacteria contamination in the treated water provided to the public.

Source Water Use Avoidance Strategies
˜Avoidance strategies™ refers to actions a water system may take to avoid or minimize poor quality source water entering the treatment system, such as blending surface water with ground water or pumping into off-stream reservoirs only when surface water quality is high. The workgroup initially

proposed that avoidance strategies be considered an indicator of drinking water impairment. However, there are many other reasons for using such strategies. In the end, the workgroup agreed that avoidance strategies, and the reasons for them, will be captured during the assessments to help determine whether a system-s-treated water quality data can identify impaired source water. A public water system-s-use of ˜beyond conventional treatment™(e.g., powered activated carbon for pesticide removal) will be handled in the same manner.

ASSESSMENT DATA

Data Selection

The PDWS beneficial use assessment approach considers multiple lines of evidence to evaluate a water body—ability to support the public drinking water supply designated use. During the data evaluation process, the workgroup considered SDWA compliance data, source water quality data, and treatment plant process information. Water quality indicator and data source selection was driven by requirements of source water relevance and availability of credible, measurable data. In order to capture current water quality conditions, it was determined that assessments would focus on the most recent five years of data. The following sections contain descriptions of available databases with advantages and disadvantages for each. The last section discusses the treatment plant process inventories and how that information will be applied.

Source Water Quality Data

Source water samples are representative of the current in-stream water quality and provide the most appropriate indicator for PDWS use assessment. However, reliance solely on source water data is problematic due to limited data and limited resources for future sample collection.

In the spring of 2003, Ohio EPA initiated collection of source water samples to support PDWS use determinations. Each year, in conjunction with ongoing watershed water quality studies, sampling will be conducted near the public water supply intakes within the study areas. Samples are analyzed for nitrate, pesticides and other source water contaminants as appropriate. Ohio EPA will use information from Drinking Water Source Assessment Reports, TMDL Reports, Unregulated Contaminant Monitoring Rule (UCMR), and other special studies to determine future sampling sites, sampling frequency, and water quality parameters. Sampling will also focus on areas where water systems are using treatment beyond conventional and/or source water management strategies to avoid poor source water quality. All water quality data generated by Ohio EPA will be managed as other surface water quality data and maintained in the agency-s-STORET database.

Many public water systems collect raw water data for operational and source water protection purposes but most of this data is not routinely submitted to Ohio EPA. Water systems will be contacted to identify which systems have relevant data and are willing to share it with the agency for assessment purposes. Data used to support impairment determinations must meet level 3 credible data requirements as defined in OAC Chapter 3745-4. However, Ohio EPA may utilize source water data that is not qualified as level 3 to guide future agency sampling efforts, corroborate credible data, and identify regional source water quality concerns.

Public Water System Compliance Data

Public water system compliance data provide a measurement of the treated water quality. The water quality data is collected and submitted to Ohio EPA to determine compliance with SDWA drinking water regulations. This is a large database of reliable and historic data maintained by the Division of Drinking and Ground Waters. Data will be evaluated from the most recent five years. Conventional treatment is expected to result in safe drinking water by removing contaminants from

the source water. However, it may be ineffective for certain contaminants at any level (e.g., nitrates) and some contaminants if present in source water at elevated levels (e.g., pesticides). Consequently, use of compliance data as an indicator of source water quality may be limited by the treatment processes. For example, treatment processes beyond conventional, such as granular activated carbon, would likely result in reduced pesticide concentrations and not provide an accurate assessment of pesticide levels in the source water.

For the purposes of these assessments, conventional treatment refers to baseline treatment required by Ohio rules for public water systems using surface water as a source and is defined as conventional filtration and disinfection. Conventional filtration treatment is defined in OAC rule 3745-81-01 as a series of processes including coagulation, flocculation, sedimentation, and filtration resulting in substantial removal of particles. Standard disinfection processes, such as chlorination, are also considered conventional. Treatment processes considered beyond conventional are as follows: activated carbon (powered and granular), ion exchange, electrodialysis, ozonation, reverse osmosis, enhanced coagulation and membrane filtration.

Surface water public water systems are required to monitor nitrate monthly or at a greater frequency if concentrations approach the MCL or a violation is issued. Therefore, over a five year period, there should be at least 60 nitrate compliance samples per water system. Synthetic organic chemical monitoring, including pesticides, varies and is based on the results of previous monitoring. All surface water systems monitor at least once a year for alachlor, atrazine and simazine. Additional sampling for these contaminants is dependent on the frequency and level of contaminants detected. Water systems with a mean nitrate value greater than 2 mg/L for the past five years are required to sample for an additional subset of 14 synthetic organic compounds.

Public Water System Violation History

The Division of Drinking and Ground Waters maintains a database of all violations issued to public water systems. As part of the PDWS beneficial use assessment, a file review and discussion with the division drinking water staff will be conducted. Any source water related SDWA Primary MCL violations will be discussed in the assessment reports. SDWA MCLs are the maximum allowable level of a contaminant that may be present without posing a high risk of health effects. Ohio—s SDWA MCL values are defined in OAC chapter 3745-81; are available online at http://www.epa.state.oh.us/ddagw/loac.htm#effective and are summarized at http://www.epa.state.oh.us/ddagw/Documents/StandardsList.pdf.

Treatment Plant Process Inventory

As part of the assessment process the public water system will be contacted and asked to complete a PDWS survey in order to obtain treatment history, verify current treatment processes and purpose, estimate treatment cost, and identify local source water concerns. The agency—s district office drinking water program staff will also be contacted and internal files reviewed in order to generate a summary of current treatment and source water concerns for each water system. This information will be compiled and used to identify regional and statewide source water concerns as related to public water system treatment costs and limitations.

ASSESSMENT PROCEDURE AND IMPAIRMENT DETERMINATION

The PDWS beneficial use assessment involves comparison of water quality data to established human health criteria. This section describes the assessment procedure including rationale for how the criteria will be applied and data requirements for concluding attainment status. The later is particularly important when attainment decisions are based solely on assessment of chemical criteria.

Water Quality Criteria

A complete listing of Ohio ~~s~~ surface water quality criteria for the protection of the public drinking water supply beneficial use is provided in the Appendix A. Ohio ~~s~~ surface water quality criteria are defined in OAC chapter 3745-1:

3745-1-04	Criteria Applicable to all Waters
3745-1-07	Water Use Designations and Criteria
3745-1-31	Lake Erie Standards
3745-1-32	Ohio River Standards
3745-1-33	Water Quality Criteria for the Lake Erie Drainage Basin
3745-1-34	Water Quality Criteria for the Ohio River Drainage Basin
3745-1-36	Methodologies for Development of Aquatic Life Criteria and Values
3745-1-38	Methodologies for Development of Human Health Criteria and Values for the Lake Erie Drainage Basin
3745-1-39	Methodology for Development of Wildlife Criteria for the Lake Erie Basin

Nitrate

Ohio ~~s~~ water quality criterion for nitrate is 10 mg/L, directly corresponding to the SDWA MCL. Nitrate SDWA MCL violations are typically based on a single sample with a follow-up sample to confirm an exceedance of the MCL standard. Due to the fact that conventional treatment is ineffective at nitrate removal, the WQ criterion will be applied as a maximum value and not as an average. Impaired conditions were developed with the acknowledgment that source water nitrate concentrations are not only influenced by land application and discharge rates (point sources) within the watershed, but also by the timing and intensity of precipitation events. For example, studies by the water Quality lab at Heidelberg College indicate that in some Ohio lake Erie Basin streams, high flows exceeded only 20% of the time accounted for over 80% of the total nitrate export (http://wql-data.heidelberg.edu). However, an extreme precipitation event may cause an atypical spike of nitrate in the source water. This scenario is addressed by the allowance for a PDWS source water to incur one excursion above the water quality criterion in the past five years without being designated as impaired. An excursion is defined as any nitrate value exceeding the water quality criteria but must be at least 30 days apart from the next excursion in order to capture separate or extended source water quality events. Repeated excursions above the criterion within the last five years are indicative of a persistent source water problem and would result in an impaired status.

Impaired conditions for nitrate are defined as two or more excursions within the most recent five year period. All waters not meeting the impaired condition will be considered in full attainment of the PDWS beneficial use. Any waters in full attainment with at least one value 8.0 mg/l or higher will be placed on the ˜watch list™ The level represents 80% of the WQ criterion and any surface water public water system reporting a value of 8mg/L or higher of nitrate would be recommended to conduct additional compliance monitoring.

Pesticides

WQ criteria for pesticides listed in OAC Chapter 3745-1 are based on established SDWA MCLs. Pesticide SDWA MCLs as defined in OAC rule 3745-1-34. Impairment determinations for pesticides will only consider those pesticides with established WQ criteria. However, if data is available for pesticides without established WQ criteria, Ohio EPA will compare water quality data to the 10-day Health Advisory Levels for potential placement of the source water on the ˜Watch List.™The Health Advisory Levels were published by U.S. EPA, in the 2004 Edition of the Drinking Water Standards and Health Advisories (EPA 822-R-04-005), and are available online at http://www.epa.gov/waterscience/drinking/standards/dwstandards.pdf. Health Advisories (HAs) are non-regulatory guidance values describing contaminant concentrations that are expected to be without adverse effects on both health and aesthetics.

Impaired conditions for pesticides in source water are based on the assumption that any annual average exceeding the WQ criteria indicates a significant source water problem. Either the contaminant is elevated year-round or the maximum levels are extremely high and drive the average above the WQ criteria. This application of the criteria are consistent with methodology for determining SDWA MCL violations. Waters on the ˜watch list™requiring additional monitoring are designated where the seasonal average exceeds the WQ criteria or a single instantaneous maximum concentration is greater than four times the criteria. These pesticide levels and frequencies of occurrence have historically prompted many Ohio water systems to make treatment process changes and increase compliance monitoring. Some of these changes involve additional treatment beyond conventional or construction of off-stream reservoirs recharged via selective pumping during periods of low pesticide levels in the source water. In Ohio, pesticide levels in surface waters often fluctuate seasonally according to application time and subsequent precipitation events.

Other Contaminants

This category was designed for all other contaminants with established WQ criteria, such as metals, inorganic contaminants, and other semi-volatile and volatile organic compounds (SOCs/VOCs). While most of these contaminants do not pose serious health risks or treatment concerns to water systems using conventional treatment, they may be present is some watersheds at elevated levels. The WQ criteria will be applied as averages in order to evaluate the chronic health effects.

Impaired conditions for contaminants in this indicator are based on annual average exceedances above the WQ criteria. Contaminants will be placed on the ˜watch list™and targets for additional monitoring if any value exceeds the WQ criteria.

Cryptosporidium

Ohio does not have an established WQ criterion for *Cryptosporidium* at this time but will develop a criteria within the next few years. Currently, the 304(a) national Recommended Water Quality Criteria do not include a criterion for *Cryptosporidium.* However, should U.S. EPA develop a criterion, Ohio would consider altering the current approach. This methodology includes a proposed criterion for *Cryptosporidium* based on standards proposed under the SDWA. The impaired condition established for this indicator is based on potential future WQ criteria that directly correspond to the LT2ESWTR bin classifications for filtered public water systems. The bin classifications are based on the mean *Cryptosporidium* concentration (24 months of monthly samples) detected in raw water samples as defined in the proposed rule under the SDWA. Public water systems may be required to conduct additional treatment dependent on their bin classification and if the WQ criteria level is exceeded would likely face extensive additional treatment requirements. The proposed LT2 ESWTR was designed to target additional treatment for systems

with higher risk of *Cryptosporidium* infection. Specific information on the bin classification systems and major provisions of the rule are provided in the Appendix B.

Impaired conditions for *Cryptosporidium* are based the proposed criterion of 1.0 oocysts/L. Source waters with an annual average above the proposed criterion would indicate an increased risk to human health and likely result in costly treatment upgrades to the water treatment plant in order to fulfill requirements of the SDWA. Source waters will be placed on the ˜watch list™ if the annual average for *cryptosporidium* is between 0.075 and 1.0 oocysts/L. Water systems with these levels may be required to conduct additional treatment in order to meet SDWA requirements.

Supplemental Indicators

Supplemental indicators will be assessed if algae or taste and odor are identified as a concern during the interview with the water system. The PDWS zone will be identified on the ˜watch list™ due to algae if two of the following three conditions exist: (1) PWS chemically treats source water for algae control; (2) excessive amounts of algae frequently clog and shorten the run times of treatment filters (more than 1 month per year); and (3) algae-related taste and odor problems are persistent and additional treatment processes are required or are being considered by the water system. As described previously, water quality data and other information will be assessed to determine impairment of the criteria defined in OAC rule 3745-1-07 for the protection against adverse aesthetic conditions.

Data Requirements

To ensure that PDWS beneficial use attainment determinations are conducted with an appropriate level of information several data requirements have been defined in this section. All data used for determinations must meet Ohio ~~s~~ criteria for level 3 credible data, ensuring quality data. Data qualifies for this level if collected by certified collectors and analyzed according to specified laboratory protocols, or is submitted to Ohio EPA to fulfill permit requirements. In designing data requirements Ohio EPA considered numerous U.S. EPA guidance documents, including the ˜Consolidated Assessment and Listing Methodology™, July 2002.

Ideally, all assessments would be completed with extensive treated and raw water quality data. However, sufficient source water data may not be available for all assessments at this time. At a minimum, public water system compliance data, and treatment plant process information will be available for each public water system. For water systems using conventional treatment without any source water management strategies (for avoidance or poor source water such as blending, selective pumping, off-stream reservoir, etc), the assessment may be completed with compliance data alone if source water data is not available. For water systems using advanced treatment or source water avoidance strategies it will be necessary to have a minimum amount of source water data in order to complete the assessment. Table 1 provides a summary of data requirements and identifies conditions resulting in ˜Not Assessed-Insufficient Data™.

Source Water Location

To assure that surface water samples are representative of the source water, the following guidance is provided:

- Preferred location is within the 500 yard PDWS zone or directly at the intake. Samples collected at the treatment plant raw water line would also be considered representative;
- Data collected upstream of the intake beyond the 500 yards may be used if there are no significant hydrologic and water quality changes between the sample location and the intake. Dams, channel modification, tributaries with significant flow or contaminant sources may significantly alter in-stream water quality;
- For Intakes located in lakes or reservoirs with known stratification or seasonal turnover it is preferred to collect source water samples at the raw water intake line or in the lake at the same depth or zone as the raw water intake screen(s); and
- Data collected from side-channel or upground reservoirs provided that are filled with stream water only (e.g., no ground water recharge via wells to the reservoir).

Table 1 – Public Drinking Water Supply Beneficial Use Assessment Data Assumptions and Requirements

Data Available	Treatment Plant Processes	Data Valid for Attainment Determination	Specific Data Requirements
Treated Compliance Data only	Conventional treatment and no avoidance strategies[1]	Treated compliance data	Most recent 5 years
	Treatment beyond conventional and/or use of avoidance strategies	Dependent on impact of additional treatment on key indicators [2] *(If treatment designed to reduce source water contaminants then treated data may not be used alone to reach a "Full Attainment" determination)*	Most recent 5 years
Treated Compliance Data and Source Water Data	Conventional treatment and no avoidance strategies	Treated Compliance and Source Water data	Most recent 5 years
	Treatment beyond conventional and/or use of avoidance strategies	Source water data overrides treated data. Use of treated data is dependent on impact of additional treatment on key indicators.	Most recent 5 years Source water data additional requirements[3]

[1] Avoidance strategies describe actions a water system may take to avoid or minimize poor source water quality such as blending with ground water, or off-stream reservoirs with selective pumping to avoid elevated contaminant levels.

[2] When beyond conventional treatment or avoidance strategies are used, treated data may not provide an accurate representation of source water conditions. In the absence of sufficient source water data, treated data may only be used to conclude impaired conditions.

[3] If treated data is not representative of source water quality for assessment purposes, source water data must meet the requirements described below in this section in order to confirm Full Attainment status. If insufficient data is available, then the impairment determination is ˜Not Assessed-Insufficient Data™

Statistical Requirements

PDWS attainment determinations based on small sample sets present several challenges. The small sample set may fail to identify an exceedance of a water quality standard, resulting in a determination of attainment when in fact an area is impaired. Statistical confidence in the determination decision is also reduced. To address these concerns, the assessment looks at multiple lines of evidence including several sources of water quality data and treatment plant information. The attainment decision target sample size is 20 samples collected within the past five years. This sample count will provide sufficient power to detect exceedances of ≥ 15% above the criterion with a Type I error of 0.15 (Smith, et al 2001). Ohio EPA has limited resources for source water sampling , therefore attainment determinations may be concluded with a minimum of 10 samples if these samples represent the critical period when the contaminant is typically detected. Attainment decision may also be made with less than the required sample count when there is overwhelming evidence of impairment, such as a large single sample exceedance (verified with a repeat sample).

Many source water contaminants occur in surface waters seasonally with maximum concentration in early spring through summer. In order to assure that sampling accurately characterizes these seasonal fluxes, at least 50% of the samples should be collected from the period May-August with at least two years represented. In order to minimize dataset seasonal bias, any impairment determination based on exceedance of a mean water quality criterion requires a minimum of 10 samples representing at least two seasons. If a large dataset is available with sample collection skewed toward high flow events, it may be recommended to calculate flow-weighted seasonal or monthly average values.

Attainment Status Determination

Figure 4 illustrates the simplified decision process for attainment determinations. All assessments will begin with a qualitative and quantitative evaluation of available water quality data to determine if sufficient Level Three credible data are available. If sufficient data is available, Ohio EPA will determine if any impaired conditions are met. Source waters in Full Attainment will further be evaluated for ˜watch list™conditions. A narrative description of source water conditions for each attainment category is as follows:

- Impaired: Source water quality is degraded to the extent that human health risk is elevated and/or the water system must utilize additional treatment beyond conventional or invest in off-line storage or alternative water sources to meet SDWA requirements. Water systems may incur significant expenses from additional treatment, construction of reservoirs or development of ground water sources.

- Full Attainment: Source water quality is adequate for water systems using conventional treatment to meet primary SDWA, MCL standards. Contaminant levels are consistently below SDWA MCLs and Ohio surface water quality standards.

- Not Assessed - Insufficient Data: This attainment determination will apply when there is insufficient source water data available and treated water data is inconclusive. The following scenarios may result in insufficient data status: (1) lack of source water quality data and application of compliance data is limited due to additional treatment or source water avoidance strategies; (2) limited source water data may indicate an exceedance of the criteria but additional monitoring is needed to meet sample size requirements.

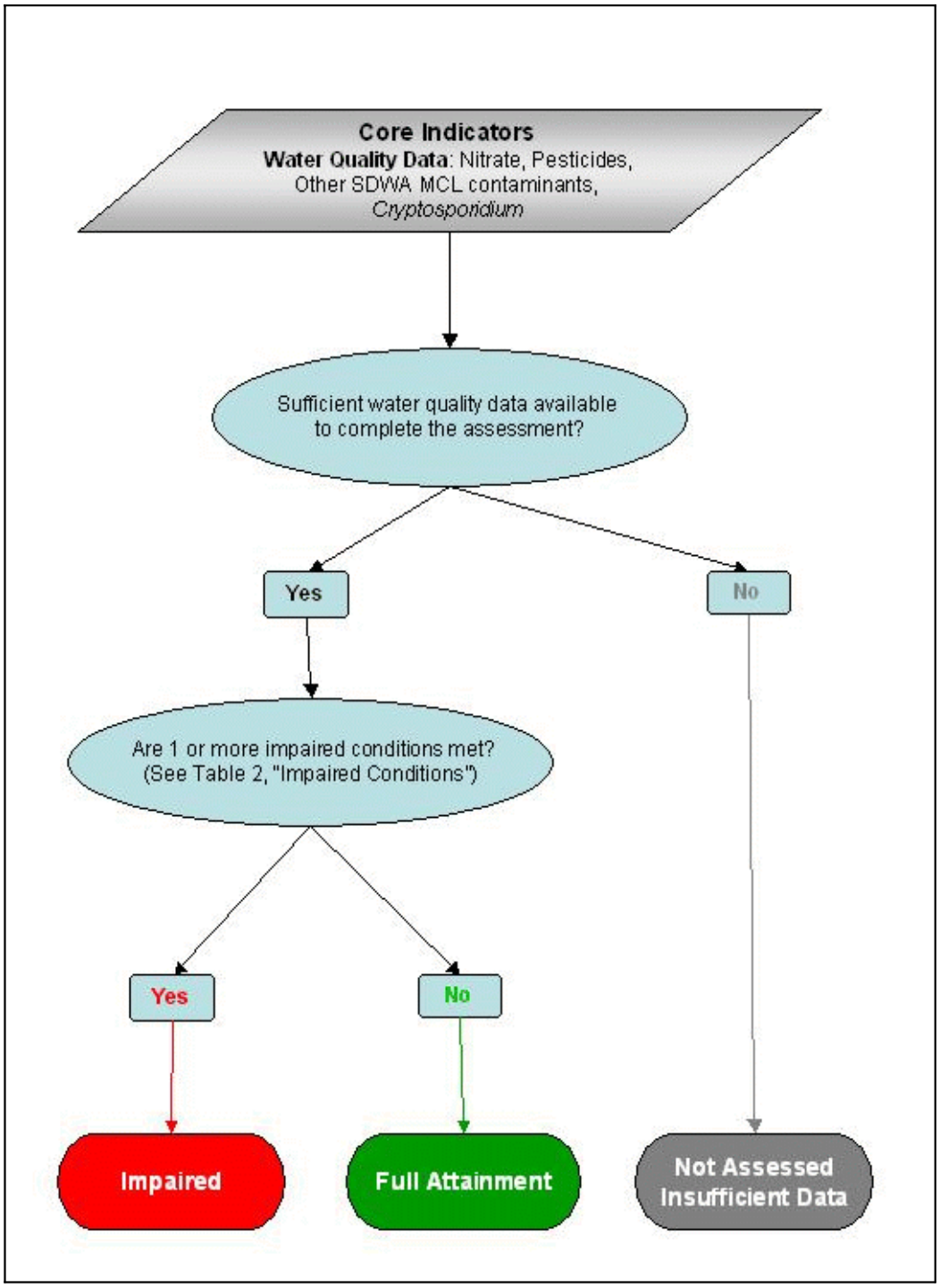

Figure 4 - PDWS Attainment Determination Flowchart

Source waters will be placed on a ˜watch list™where water quality is impacted but not at a level that indicates impairment. While these waters are still considered in full attainment of the PDWS use, they will be targeted for additional monitoring and more frequent assessment.

Each core indicator will be evaluated and an attainment status determined based on the conditions defined below and water quality criteria described in OAC Chapter 3745-1. Table 2 provides a list of core indicators and corresponding impaired conditions along with water quality conditions which place the source water on the ˜watch list™,™resulting in increased monitoring and assessment.

Table 2 – Public Drinking Water Supply Impairment Determination
Applies to in-stream ambient and treated water quality data for the most recent five year period.

Indicator	**Impaired Conditions**
Nitrate	❑ Two or more excursions[1] above the WQ criteria within the 5 year period
Pesticides	❑ Annual average exceeds WQ criteria
Other Contaminants	❑ Annual average exceeds WQ criteria
Cryptosporidium	❑ Annual average exceeds WQ criteria (1.0 oocysts/L)
Indicator	**Full Attainment Conditions**
Nitrate	❑ No more than one excursion[1] above the WQ criteria within the 5 year period
Pesticides	❑ Annual average does not exceed the WQ criteria
Other Contaminants	❑ Annual average does not exceed the WQ criteria
Cryptosporidium	❑ Annual average does not exceed the WQ criterion
Indicator	**"Watch List" Conditions** *Source waters targeted for additional monitoring and assessment*
Nitrate	❑ Maximum instantaneous value > 8 mg/L (80% of WQ criterion)
Pesticides	❑ Running quarterly average ≥ WQ criteria ❑ Maximum instantaneous value ≥ 4x WQ criteria
Other Contaminants	❑ Maximum instantaneous value ≥ WQ criteria
Cryptosporidium	❑ Annual average ≥ 0.075 oocysts/L

[1] Excursions must be at least 30 days apart in order to capture separate or extended source water quality events.

WQ Criteria - Human Health WQ criteria defined in OAC Chapter 3745-1 established to protect in-stream water quality for the PDWS beneficial use

Reporting and 303(d) Listing

Assessments will initially be completed for all active public drinking water intakes every four years to coincide with the Integrated Assessment Report and then repeated at four to six year intervals. It is assumed that additional source water quality data will be available at least every five years. Other water bodies designated with the PDWS use by rule and do not have active intakes will not be assessed at this time due to a lack of data. If data become available all listed bodies of water with a PDWS beneficial use designation will be evaluated in subsequent years.

Public Drinking Water Supply › Watershed Assessment Reports

Results of the PDWS use assessments will be incorporated into the Watershed Assessment Unit Summaries in Ohio ~~s~~ Integrated Water Quality Report. Each summary will contain the impairment status and when known the pollutant causing impairment will be identified. For assessments completed in conjunction with watershed surveys and TMDL projects the Technical Support Documents (TSD) or other water quality survey reports will include a section summarizing the data collected for assessment of the PDWS use. Additionally, Ohio EPA will prepare detailed watershed reports specifically for the PDWS use. Assessment information and water quality data will be presented and discussed in context of watershed specific issues, including land use changes, utilization of non-point source BMPs within the watershed and current source water issues affecting the water systems. These reports will likely cover the HUC-8 watershed unit and include descriptions of the treatment processes, any source water management tactics utilized by the water system to avoid poor source water, and estimated additional treatment costs related to poor source water quality. Areas lacking adequate source water data for accurate assessment of the PDWS use will be identified and any ongoing source water protection efforts will be described.

Integration in the 303(d) Listing Process

Source waters identified as impaired for the PDWS beneficial use will be classified as Category 5 on the 303(d) listing process. Waters impaired for the PDWS use may also influence the water body—sposition on the TMDL priority list. A more complete description of how the PDWS use assessments will be integrated into the 303(d) listing will be included in Ohio ~~s~~ 2006 or 2008 Integrated Water Quality Report.

APPENDIX A

OHIO WQ CRITERIA FOR PROTECTION OF THE PDWS USE COMPARISON TO SDWA MCLS

Ohio Water Quality Criteria for Protection of the PDWS Use Comparison to SDWA MCLs *(ug/L unless noted otherwise)*					
Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
1,1,1-Trichloroethane	200	200a	73,000		
1,1,2-Trichloroethane	5	5.0ac	6.0c	0.59	
1,1-Dichloroethylene	7	0.57c	0.56c	0.057	
1,2 (o)-Dichlorobenzene	600	600a	2000	2700	Discharge from industrial chemical factories
1,2,4-Trichlorobenzene	70	70a		260	
1,2-Dichloroethane	5	3.8c	3.8c	0.38	
1,2-Dichloropropane	5	5.0ac	9.1c	0.5	
1,4 (p)-Dichlorobenzene	75	75a	24c		Discharge from industrial chemical factories
2,4-D (2,4-Dichlorophenoxy-acetic acid)	70	70a			
Alachlor	2	2a			
Aldicarb sulfone1		7a			
Aldicarb sulfoxide1		7a			
Aldicarb1		7a			
Antimony	6	6a	9.7	**5.6**	
Arsenic	10	10a	10a	10	
Asbestos (MFL)	7	7a		7.0	
Atrazine	3	3a			
Barium	2,000	2,000a	2,000a	1000	
Benzene	5	5ac	12c	2.2	
Benzo(a)pyrene	0.2	0.044c	0.00002	0.0038	
Beryllium	4	4.0a	17c		
Di (2-ethylhexyl)phthalate	6	6.0ac	25c	1.2	
Bromate	10	10a			Inorganic DBP
Bromodichloromethane	TTHMs [2]	5.6c	6.8c		UCM - Organic DBP
Bromoform	TTHMs [2]	43c	52c	4.3	UCM - DBP
Cadmium	5	5.0a	14		
Carbofuran	40	40a			Leaching of soil fumigant used on rice and alfalfa (under federal review)
Carbon tetrachloride	5	2.5c	2.4c	0.23	
Chloramine	4,000	4,000a			
Chlordane	2	0.021c	0.00025c	0.0008	
Chloride	250,000	250,000a	250,000a	250,000	Secondary MCL

Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
Chlorine	4,000	4,000a			Disinfection Residual (MRDL)
Chlorine dioxide	800	800a			Disinfection Residual (MRDL)
Chlorite	1,000	1,000a			Inorganic DBP
Chloroacetic acid	HAA5[3]	60a			
Chlorobenzene	100	100a	470	100	
Chlorodibromomethane (Dibromochloromethane)	TTHMs[2]	4.1c	6.8c	0.4	UCM - DBP- soil fumigant
Chloroform	TTHMs[2]	57c	56c	5.7	UCM - Organic DBP
Chromium	100	100a	140		
cis-1,2-Dichloroethylene	70	70a	880		
Copper	1,300		790	1,300	MCL=1.3 exceeded in >10% of tap samples during compliance period (Action Level)
Cyanide	200	200a	600	700	
Dalapon	200	200a			
Di(2-ethylhexyl)adipate	400	400a			
Dibromoacetic acid	HAA5[3]				
Dibromochloropropane (DBCP)	0.2	0.2a			soil fumigant (DBPC-1,2-Dibromo-3-Chloropropane)
Dichloroacetic acid	HAA5[3]	60a			DBP
Dinoseb	7	7.0a			
Dioxin (2,3,7,8-TCDD)	$3.0x10^{-5}$	$1.3x10^{-7}$c	$8.6x10^{-9}$c	$5.0x10^{-6}$	
Diquat	20	20a			
Total Dissolved solids	500,000	750,000/500,000a	750,000/500,000a		Secondary MCL
Endothall	100	100a			
Endrin	2	0.76		0.76	
Ethylbenzene	700	700a	2100	3,100	
Ethylene dibromide (EDB)	0.05	0.050a			
Fluoride	4,000	4,000a		1,000	
Glyphosate	700	700a			
Gross Alpha Particles (pCi/L)	15			15	
Gross Beta Particles (pCi/L)	50			50	
Haloacetic acids (HAA5) 3	60				DBP
Heptachlor	0.4	0.0021c		0.00079	
Heptachlor epoxide	0.2	0.001c		0.000039	
Hexachlorobenzene	1	0.0075c	0.00045c	0.00028	
Hexachlorocyclopentadiene	50	50a		50	

Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
Iron	300	300a	300a		Secondary MCL
Lead	15		14		MCL=0.015 exceeded in >10% of tap samples during compliance period (Action Level)
Lindane (gamma-Hexachlorocyclohexane)	0.2	0.19c	0.47	0.019	
Manganese	50		50		Secondary MCL
Mercury	2	0.012	0.0031	0.012	
Methoxychlor	40	40a			
Methylene chloride (Dichloromethane)	5	5.0ac	47c	4.6	UCM
Monobromoacetic acid	TTHMs[2]				DBP
Monochloroacetic acid	TTHMS[2]				DBP
Monochlorobenzene	100				
Nickel	100	610	470	610	
Nitrate (as N)	10,000	10,000a	10,000a	10,000	
Nitrite-N	1,000	1,000a	1,000a	1,000	
Oxamyl (Vydate)	200	200a			
Pentachlorophenol	1	1.0ac	1.0ac	0.27	
Picloram	500	500a			
Polychlorinated biphenyls (PCBs)	0.5	0.0017c	0.000026c	0.000064	
Radium (Combined -226 and -228) (pCi/L)	5			4	
Selenium	50	50a	130	50	
Silver	100	50	130	50	Secondary MCL
Silvex (2,4,5-TP)	50	10			
Simazine	4	4.0a			
Strontium 90 (pCi/L)	8			8	
Styrene	100	100a			
Sulfate	250,000	250,000a	250,000a	250,000	Secondary MCL - UCM
Tetrachloroethylene	5	5.0ac	320		
Thallium	2	1.7	1.2	1.7	
Toluene	1,000	1,000a	5,600	1,000	
Total Trihalomethanes (TTHMs)2	80				DBP
Toxaphene	3	0.0073c	0.000068c	0.00028	
trans-1,2-Dichloroethylene	100	100a	470	100	
Trichloroacetic acid	HAA5[3]	60a			DBP
Trichloroethylene	5	5.0ac	29c	2.5	

Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
Tritium (pCi/L)	20,000				
Vinyl chloride	2	2.0ac	0.48c	2.0	
Xylenes (total)	10,000	10,000a	31,000		
Zinc	5,000	9,100	5,000	7,400	Secondary MCL
1,1,2,2-Tetrachloroethane		1.7c	1.7c	0.69	Unreg. contaminant which monitoring required under 141.40
1,1-Dichloroethane			1500		UCM
1,2,4,5-Tetrachlorobenzene		2.3			
1,2,4-Trimethylbenzene			49		UCM
1,2-Diphenylhydrazine		0.4c		**0.036**	
1,3,5-Trimethylbenzene			55		
1,3-Dichlorobenzene		400	5200	320	
1,3-Dichloropropene		10		10	UCM
1,4-Dioxane		32c	32c		
2,4 Dinitrophenol		450	710	69	
2,4,6-Trichlorophenol	21c	27c		1.4	
2,4-Dichlorophenol		0.3	0.3	5.0	Protection againts adverse organoleptic (taste&odor) effects
2,4-Dimethylphenol		540	450	380	
2,4-Dinitrotoluene		1.1c		0.11	
2-Chloronaphthalene		1700		1,000	
2-Chlorophenol		0.1	0.1	5.0	Protection againts adverse organoleptic (taste&odor) effects
3,3'-Dichlorobenzidine		0.4c		0.021	
4,4'-DDD		0.0083c		0.00031	
4,4'-DDE		0.0059c		0.00022	
4,4'-DDT		0.0059c	0.00015	0.00022	
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)		13		13	
Acenaphthene		1,200	570		
Acenaphthylene			850	670	
Acrolein		320		190	
Acrylonitrile		0.59c	0.53c	0.051	
Aldrin		0.0013c		0.000049	UCM
alpha-Endosulfan[4]		110		62	
alpha-Hexachlorocyclohexane		0.039c	0.0048c		
Aluminum			970		Secondary MCL

Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
Anthracene		9,600	590	8,300	
Benzidine		0.0012c		0.000086	
Benzo(a)anthracene		0.044c		0.0038	
Benzo(b)fluoranthene		0.044c		0.0038	
Benzo(k)fluoranthene		0.044c		0.0038	
beta-Endosulfan[4]		110		62	
beta-Hexachlorocyclohexane		0.14c	0.013c		
Bis(2-Chloroethyl)ether		0.31c		0.03	
bis(2-Chloroisopropyl)ether		1400		1,400	
bis(2-Chloromethyl)ether		0.0013c			
Boron			2400		
Butyl benzyl phthalate		3000		1,500	
Chrysene		0.044c		0.0038	
Dibenzo(a,h)anthracene		0.044c		0.0038	
Dieldrin		0.0014c	0.0000065c	0.000052	UCM
Diethyl phthalate		23000		17,000	
Dimethyl phthalate		310000		270,000	
Di-n-butyl phthalate		2700	31	2,000	
Dinitrophenols[5]		70			
Endosulfan[4]		110			
Ethylene glycol			56,000		
Fluoranthene		300	9.4	130	
Fluorene		1300	250	1,100	
Hexachlorobutadiene		4.4c	0.22c	0.44	UCM
Hexachlorocyclohexane - technical grade		0.12c	0.013c		
Hexachloroethane		19c	5.3c	1.4	
Indeno(1,2,3-c,d)pyrene		0.044c		0.0038	
Isophorone		360c		35	
Isopropylbenzene			1,700		UCM
Methyl bromide (bromomethane)		48	39	47	UCM
Mirex			0.00072		
Molybdenum			120		
Naphthalene			540		UCM
Nitrobenzene		17c		17	
Nitrosoamines		0.008c			
N-Nitrosodibutylamine		0.064c			
N-Nitrosodiethylamine		0.008c			

Contaminant	Ohio SDWA MCLs	Ohio River Drainage WQC	Lake Erie Drainage WQC	ORSANCO WQC	Comments
N-Nitrosodimethylamine		0.0069c		0.00069	
N-Nitrosodi-n-propylamine		0.05c		0.005	
N-Nitrosodiphenylamine	50c			3.3	
N-Nitrosodipyrrolidine		0.16c			
Pentachlorobenzene		3.5	0.18		
Phenol		1	1	5	Protection against adverse organoleptic (taste&odor) effects
Pyrene		960	15	830	
Strontium			18,000		

WQC = Water quality criteria
LE - Ohio Clean Water Act WQC for Lake Erie Drainage Basin
OR - Ohio Clean Water Act WQC for Ohio River Drainage Basin
DW = Ohio SDWA Water Quality Standards
ORSANCO = Ohio River Sanitary Commission Standards for Ohio River mainstem
MFL = Million fibers per liter, longer than 10 um or million fibers/L greater than 10 um.
MRDL = Maximum Residual Disinfectant Level

a - This criterion based on the Maximum Contaminant Levels (MCLs) developed under the "Safe Drinking Water Act".
c - Criteria for this chemical are based on a carcinogenic endpoint developed by U.S. EPA for 304(a) criteria.

1 - The WQ criterion for this chemical applies to the sum of aldicarb, aldicarb sulfone and aldicarb sulfoxide. The U.S. EPA MCL for this contaminant is presently stayed.
2 - Total Trihalomethanes includes chloroform, bromoform, bromodichloromethane and chlorodibromethane. Disinfection byproducts. The MCL applies as the sum of these contaminants.
3 - Haloacetic acids (HAA5) includes trichloroacetic acid, dichloroacetic acid, monobromoacetic acid, monochloroacetic acid and dibromoacetic acid. Common disinfection byproducts. The MCL applies as the sum of these contaminants.
4 - The criteria for this chemical apply to the sum of alpha-endosulfan, beta-endosulfan and endosulfan sulfate.
5 - The criteria for this chemical apply to the sum of all dinitrophenols.

APPENDIX B

SUPPLEMENTAL INFORMATION ON LT2ESWTR

This table and information provide a summary of the Proposed Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and is copied from the U.S. EPA quick reference guide and fact sheet for this rule. Revisions from the final rule will be incorporated into this methodology document.

Bin Classifications for Filtered Public Water Systems (LT2ESWTR)					
		Additional *Cryptosporidium* Treatment Required			
Cryptosporidium **Mean (oocysts/L)**	**Bin Classification**	**Conventional Filtration**	**Direct Filtration**	**Slow Sand or Diatomaceous Earth Filtration**	**Alternative Filtration***
< 0.075	Bin 1 **	None	None	None	None
0.075 to < 1.0	Bin 2	1 log	1.5 log	1 log	4 log
1.0 to < 3.0	Bin 3	2 log	2.5 log	2 log	5 log
> 3.0	Bin 4	2.5 log	3 log	2.5 log	5.5 log

* Treatment requirements in this column are TOTAL treatment requirements. The state will determine compliance with these treatment requirements.

** Systems serving < 10,000 people that are not required to monitor for *Cryptosporidium* are placed in Bin 1.

˜Log Removal™ refers to the magnitude of removal of a contaminant by treatment. For example, if the concentration of a contaminant is 1,000 ug/l before treatment and 1 ug/l after treatment, the remaining concentration is in-thousandth of the original concentration (1.0×10^{-3}); this would be a ˜3-log removal™ The Interim Enhanced Surface Water Treatment Rule (IESWTR) established a requirement for 2-log (99%) removal of *Cryptosporidium* for systems that currently filter under the Surface Water Treatment Rule. Systems operating conventional or direct filtration will meet this requirement if they are in compliance with the strengthened turbidity performance standards established in the IESWTR.

Major Provisions of LT2ESWTR

- Filtered and unfiltered systems serving ≥ 10,000 people must conduct 24 months of source water monitoring for *Cryptosporidium*. Bin classification will be based on the mean concentration. Filtered systems must also record source water *E. coli* and turbidity levels.
- Filtered systems serving < 10,000 people must conduct 12 months of source water monitoring for *E. coli*. If the *E. coli* trigger level is exceeded, the system must conduct an additional 12 months of source water monitoring for *Cryptosporidium*. The trigger level for lake and reservoir sources is 10 *E. coli*/100 ml and for flowing stream sources is 50 *E. coli*/100ml.
- Filtered systems providing 5.5 log of treatment for *Cryptosporidium* and unfiltered systems providing 3-log of treatment for *Cryptosporidium* are not required to conduct source water monitoring.