

# **Draft 2010 Integrated Water Quality Monitoring and Assessment Methods**

This document was prepared pursuant to Section 303(d)  
of the Federal Clean Water Act

State of New Jersey  
Department of Environmental Protection  
Water Monitoring and Standards

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## 1.0 Introduction

### 1.1 Background

Since 2001, the United States Environmental Protection Agency (USEPA) has recommended that states integrate their Water Quality Inventory Report (required under Section 305(b) of the federal Clean Water Act (Act)) with their List of Water Quality Limited Segments (required under Section 303(d) of the Act). New Jersey submitted its first Integrated Water Quality Monitoring and Assessment Report (Integrated Report) in 2002. The New Jersey Department of Environmental Protection's (Department) 2010 Integrated Report will continue to follow the integrated format to provide an effective tool for maintaining high quality waters where designated uses are attained, and improving the quality of waters that do not attain their designated uses.

The Integrated Report includes an “Integrated List” that combines the reporting requirements of Sections 305(b) and 303(d) of the Act. The Integrated List is the only part of the Integrated Report that is subject to regulatory requirements, which include public participation and submission to USEPA for approval and adoption. The Integrated List identifies the status of all applicable designated uses for every assessment unit by labeling the results of each designated use assessment as one of the five sublists (see Section 7.1 for complete sublist descriptions). Sublists 1 through 4 satisfy the assessment and reporting requirements of Section 305(b), while Sublist 5 is used to satisfy Section 303(d).

Section 303(d) requires states to produce a list of waters that are not meeting surface water quality standards (SWQS) despite the implementation of technology-based effluent limits and thus require the development of total maximum daily loads (TMDLs). This list is referred to as the “List of Water Quality Limited Segments” or the “303(d) List”. The Department will be submitting the 2010 Integrated List to USEPA Region 2 via its Assessment Database (ADB). However, since the public will be afforded the opportunity to review and comment on the Integrated List, the Department will also generate an Integrated List Table that organizes assessment results by assessment unit, designated use, and sublist. The Department will also generate a separate List of Water Quality Limited Segments (303(d) List) that includes all assessment units identified as Sublist 5 (i.e., not attaining one or more designated uses), the specific pollutants not meeting SWQS in each assessment unit, and the relative rank of the assessment unit/parameter combination for TMDL development.

USEPA Guidance recommends placing the assessment results into one of five specific categories. The Department has chosen to use the term “sublist” rather than “category” when referring to the Integrated List, to avoid confusion between Category 1 of the Integrated List and Category One Waters designated under New Jersey’s SWQS at N.J.A.C. 7:9B. Prior to developing an Integrated List, states are required to publish, for USEPA and public review, the methods used to collect, analyze, and interpret data, and place assessment units on their respective sublists.

The Methods Document provides an objective and scientifically sound assessment methodology, including:

- A description of the data the Department will use to assess attainment of the designated uses;

- The quality assurance aspects of the data;
- A detailed description of the methods used to evaluate designated use attainment;
- The rationale for the placement of assessment units on one of the five sublists.

The Methods Document does not establish assessment methods for assessing raw data on the Delaware River mainstem, Estuary, and Bay, fish tissue data for fish consumption, or pathogen data for shellfish. The Department uses published fish consumption advisories and shellfish classifications established under N.J.A.C. 7:12 to assess fish consumption and shellfish harvest uses. The Methods Document does explain how the Department uses the fish consumption advisories and shellfish classifications to assess the fish consumption and shellfish harvest for consumption designated uses (see Sections 6.3 and 6.4). The water quality assessment for the Delaware River mainstem, Estuary, and Bay is conducted by the Delaware River Basin Commission (DRBC) and its assessment results are incorporated into New Jersey's Integrated List.

## **1.2 Summary of Major Changes from the 2008 Methods Document**

### **Temperature**

On April 20, 2009, the Department proposed to replace the existing seasonal average temperature criteria with acute and chronic criteria to better protect the State's cold and warm water fisheries. The Department will evaluate continuous monitoring data with recordings taken anywhere between once per hour to every 15 minutes for weeks at a time against these new shorter term criteria. See section 4.1, Temperature under Continuous Monitoring. The proposal is available at: <http://www.nj.gov/dep/rules/proposals/042009a.pdf>

### **pH**

The Department has proposed new pH range of 4.5 - 7.5 for FW2 freshwaters located adjacent to the boundaries of the Pinelands Protection and Preservation Area, waters located in the Atlantic, lower Delaware, and lower Raritan drainages. To implement this new pH, the Stream Classification Tables at N.J.A.C. 7:9B-1.14 were also modified. The proposal is available at: <http://www.nj.gov/dep/rules/proposals/042009a.pdf>

### **Phosphorus**

The Department's assessment method for phosphorus in freshwaters was based upon water column numeric total phosphorus criteria. It is widely recognized that excessive productivity can be influenced by many causes. Physical and chemical factors can influence nutrient dynamics/availability. These include flow regime, water depth, retention time, land use, channel morphology, stream bank stability, pool/riffle sequence, canopy cover, bottom substrate, water color, organic content, and temperature. These in turn impact productivity, vegetation and aquatic life diversity. The Department's experience implementing the Phosphorus Technical Manual further demonstrated that a single numeric criteria may not be appropriate for all waterbodies and that the narrative criteria is a better way to determine where nutrients cause impairment. In addition, the Department concluded that nutrients need to be evaluated using a

“weight of evidence” approach rather than a single response indicator or numeric value for phosphorus. In order to evaluate the narrative criteria at N.J.A.C. 7:9B-1.14(d)5 and determine if phosphorus causes nutrient impairment, the Department has selected appropriate response indicators to determine where nutrients cause impairment. Nutrient impact assessments for this 2010 cycle will be based upon a series of response indicators, specifically instream dissolved oxygen levels *together with* biological data designed to evaluate compliance with the narrative criteria at N.J.A.C. 7:9B-1.14(d)5. Details of the new assessment methodology are found in section 4.4. More information on the use of the narrative criteria for phosphorus is included in the SWQS rule proposal, which is available at: <http://www.nj.gov/dep/rules/proposals/042009a.pdf>

### **Pathogens**

The Department has proposed to delete secondary contact recreation from the designated uses of FW1, PL, FW2, SE1, and SC waters (see N.J.A.C. 7:9B-1.12(a), (b), (c), (d), and (g)). FW1, FW2, PL, SE1 and SC will be assessed for primary contact recreation. Secondary contact recreation will only be evaluated in SE2 and SE3 waters. The proposal is available at: <http://www.nj.gov/dep/rules/proposals/042009a.pdf>

### **Biological Condition Indicator for Coastal Waters**

For many years New Jersey has based its aquatic life use assessment in coastal waters solely on dissolved oxygen measurements. In order to improve our assessment capabilities, this Department has been working with USEPA and Rutgers University to develop a metric for benthic invertebrate communities that accurately measures impairment of the aquatic life use in New Jersey coastal waters. A metric for the ocean waters is near completion at the time of this writing and it is hoped that ocean waters can be assessed in time for the 2010 Integrated Report. If the metric is finalized before the draft list is developed, these metrics will be used to assess aquatic life use in the ocean.

## 2.0 Overview of the Assessment Process

The Department is required to collect, review and, when appropriate, use all existing and readily available data to assess water quality for the Integrated List. With data originating from a host of different entities with different monitoring and analytical capabilities, the Department must ensure that the data used for assessment purposes is reliable and of good quality. The Department must also determine how to use the diverse types of data it generates and receives in a consistent manner to ensure an accurate evaluation of water quality on a station level, which will then be used to determine designated use attainment at the assessment unit level. The overall assessment process used by the Department, beginning with the collection of raw data, through the assessment of designated uses, to the development of the Integrated List, is comprised of five steps, each of which is explained in detail in Chapters 3 through 7. Below is a brief summary of each chapter/step in the assessment process and an explanation of key terms (shown in bold type).

### Chapter 3: Use and Interpretation of Data

The development of the Integrated List begins with collection and use of raw data. The Department reviews all existing and readily available data, as required, to ensure the use of high quality data. This includes a variety of data types, including physical/chemical data, biological community scores, beach closure days, shellfish harvest classifications, and fish consumption advisories. Some data types, such as physical/chemical data, are assessed in their raw form while other types of data, such as fish tissue concentrations and biological community scores, are evaluated by their respective programs using various methods and metrics, and only the evaluation results are used in the assessment process. All data sets are reviewed for compliance with applicable quality control and quality assurance requirements and only data that meet those requirements are used in the water quality assessment process. Chapter 3 outlines the requirements regarding quality assurance and quality control, monitoring design, age of data, accurate sampling location information, data documentation, and use of electronic data management that are taken into consideration when deciding if data are readily available and appropriate for use in generating the Integrated List. Chapter 3 also discusses the relevant policies established in the SWQS and how they relate to data interpretation.

### Chapter 4: Evaluation of Data at the Station Level

Once the data is reviewed and deemed appropriate for use in generating the Integrated List, the data for each parameter sampled at a specific monitoring station are evaluated for compliance with the SWQS. Any samples that do not comply with the applicable numeric SWQS criteria are considered **excursions** and are further reviewed to determine if noncompliance can be attributed to a less than minimum data set, deficiencies in analytical precision or accuracy, natural conditions, transient events, or flow conditions that do not represent design flows. Excursions that can be attributed to any of these conditions are not evaluated further. Excursions that cannot be attributed to one of these factors are further evaluated at the assessment unit level to determine if they collectively constitute an **exceedance** of the surface water quality criteria.

Data that cannot be evaluated based on compliance with numeric SWQS criteria, such as biological, consumption advisory, shellfish classification, and beach closure data, are assessed based on whether or not they cause water quality **impairment**, since such data serve as indicators rather than direct measures of water quality at a particular location. (Designated uses, which are assessed on an assessment unit level, are assessed as attained or not attained, as explained in Chapter 6.) Biological data are compared to established indices using a numeric scoring system representing the relative health of the biological community. The results are expressed as excellent, good, fair, or poor. Excellent and good results are assessed as not impaired; fair and poor results are assessed as impaired. Assessment of biological data at a station level is explained in more detail in Section 4.3. Similarly, the Department has established impairment thresholds for designated bathing beaches, based on the number of days a beach is closed; shellfish beds, based on classification of shellfish harvest waters; and fish consumption, based on fish consumption advisories.

Chapter 4 explains the many issues affecting the interpretation of chemical, physical, pathogenic, and biological data that the Department must take into consideration, such as sample size, frequency, magnitude, duration, outliers, censored data, and significant figures. This chapter also outlines the procedures for evaluating each parameter and making a determination as to whether or not the individual parameter complies with the applicable SWQS (including policies and narrative criteria) at each station. This chapter also includes the new assessment method for determining the impacts of phosphorus using indicators to determine compliance with the narrative criteria which reflect changes to the Department's surface water quality standards for phosphorus. The chapter also outlines the data requirements and data gathering protocols designed to support the new assessment methodology.

### **Chapter 5: Evaluating Data from Multiple Stations within an Assessment Unit**

Chapter 5 defines "assessment unit" and explains the process for identifying all stations associated with each assessment unit as well as what further evaluation of parameter-specific data is necessary when combined with other station data for the same parameter within the assessment unit. Policies for considering issues such as the spatial extent of beaches, transient phenomena, comparison of different biological metrics, use of modeling results, and grab sample versus continuous monitoring data are discussed. Assigning relative "weight" to data is necessary when evaluating numerous data sets that have different data collection and analysis methods, or temporal or spatial sampling variability. When data sets yield contradictory or ambiguous assessment results, a "weight of evidence" approach will be used to evaluate the different data sets in relation to one another. The Department will take into account the data sets' age, robustness, and accuracy. Other factors, such as declining trends, may also influence the weight of a given data set.

Although initial data evaluation is conducted on a station level, the designated use assessments and the resultant Integrated List are based on evaluation of assessment units that may be represented by data collected from multiple stations within each assessment unit. Exceedances of applicable SWQS or biological indices identified at the parameter/station level are further evaluated collectively for each parameter sampled at all monitoring stations within the assessment unit. Where data from different data sets yield contradictory assessments, further

review is conducted that considers the age of the data and the sophistication of sampling and analytical methods used to generate the data. In large data sets, the magnitude and frequency of the exceedances are evaluated. Where there are numerous beach or shellfish harvest closures within an assessment unit, the spatial coverage of these impairments are evaluated in assessing attainment of the recreation and shellfish consumption uses for the respective assessment units.

## **Chapter 6: Designated Use Assessment Methods**

Designated uses of New Jersey's surface waters include aquatic life, recreation, drinking water supply, agricultural water supply, industrial water supply, fish consumption, and shellfish harvest for consumption. Water quality assessments are conducted to determine if the designated uses are attained, or met, in a given assessment unit. In assessing use attainment, the Department considers all exceedances and impairments (explained above) identified for each assessment unit. Chapter 6 identifies the uses designated for each SWQS classification, the minimum suite of parameters needed to assess attainment of each designated use, and the process used to assess attainment based on data sampled from multiple locations and/or for multiple parameters. Appendix A lists all the parameters that the Department might use and identifies the designated uses associated with each parameter. From that list, the Department has identified a subset of parameters, referred to as the minimum suite of parameters (Table 6.0), for which sufficient data must be available to determine that a designated use is attained.

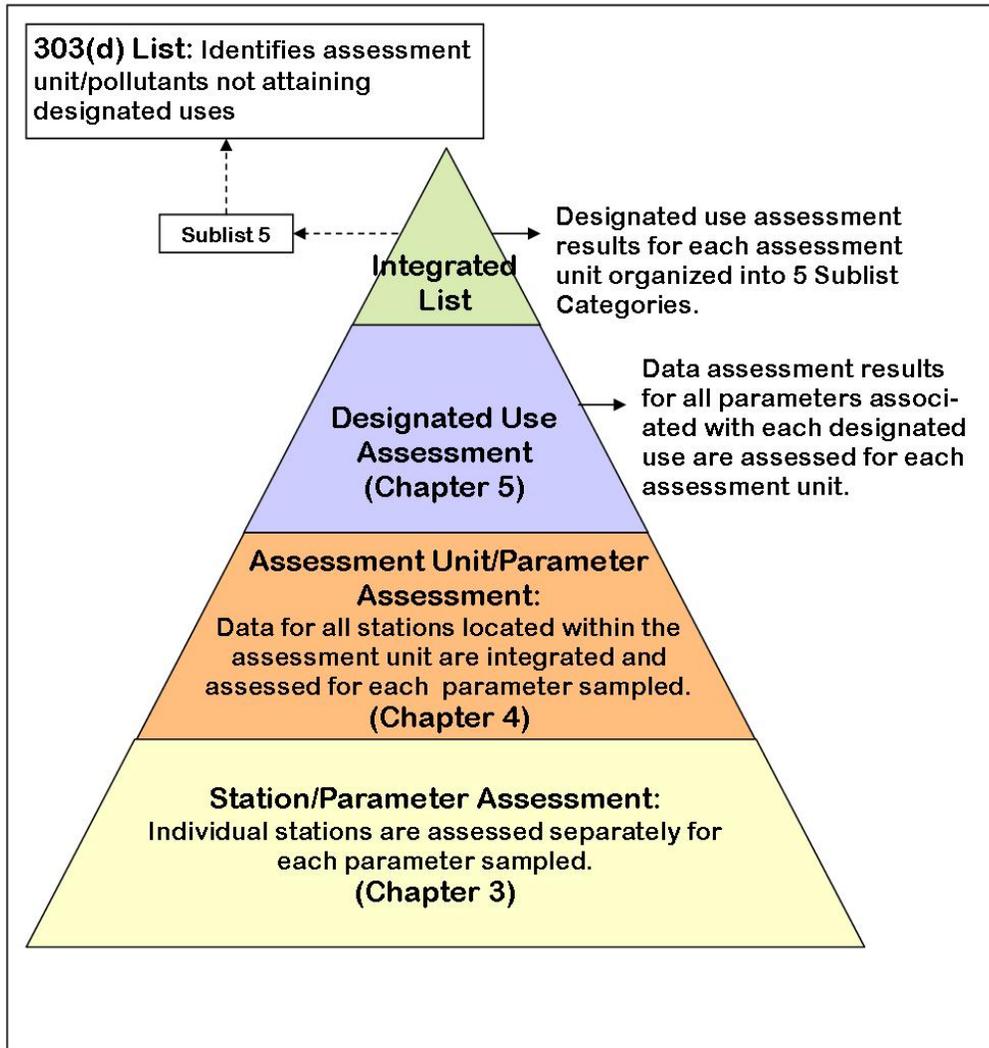
## **Chapter 7: Integrated Listing Guidance**

Chapter 7 explains how assessment results for each assessment unit/designated use combination are depicted on the Integrated List and assigned to the appropriate sublist, taking into consideration the status of TMDLs. For each assessment unit/designated use identified as Sublist 5, the Department will identify the pollutant(s) causing the non-attainment of a designated use and place the assessment unit/pollutant combinations on the 303(d) List along with the assessment unit name and its priority ranking for TMDL development. Figure 2 on the following page illustrates the relationship between the different levels of data assessment explained in Chapters 4, 5, and 6 and used to generate the Integrated List.

## **Chapters 8, 9, and 10: Prioritizing, Monitoring, and Public Participation.**

Chapter 8 describes the methods used to rank and prioritize waterbodies for TMDL development pursuant to the requirements of the federal Clean Water Act. Chapter 9 describes the State's approach to obtaining additional data to assess compliance with SWQS in all assessment units, and to support TMDL development. Chapter 10 outlines the public participation requirements and process, both regulatory and non-regulatory, employed in the development and finalization of the Integrated List. Among other things, Chapter 10 describes the data solicitation and the public notification processes.

Figure 2: Overview of Water Quality Assessment Process



### **3.0 Use and Interpretation of Data**

The Department reviews all existing and readily available data. With data originating from many diverse entities, the Department must ensure that the data used for assessment purposes is reliable and of good quality. The Department must also determine how to use the diverse types of data in a consistent manner to ensure an accurate assessment of the water quality in each assessment unit. This process is outlined below. The Integrated Report will include a list all the sources of data received and identify which sources were used, as well as provide an explanation for any data not used, to develop the Integrated List.

#### **3.1 Data Quality**

##### **Data Age**

The Department will use the most recent five years of readily available data. Data received in response to the Department's solicitation that is more than five years old may be used on a case-by-case basis. For example, older data may be used if conditions in the assessment unit have not changed. Older data may also be used in conjunction with newer data to demonstrate water quality trends where appropriate analytical methods are used and results can easily be compared with more recent data. The Department may disregard data less than five years old if newer data was collected or analyzed using scientific methods that are more precise.

##### **Electronic Data Management**

In general, only electronic data are considered "readily available" due to the significant effort needed to computerize and analyze data submitted in hard copy. The Department uses electronic data from the USEPA Storage and Retrieval (STORET) system, the United States Geological Survey (USGS) National Water Information System (NWIS), and other special programs (e.g., the USEPA Helicopter Beach Monitoring Program and local monitoring programs). The Department recognizes that USEPA is migrating from STORET to a new, more technologically advanced water quality data exchange system. The Department is currently developing web-based tools that will be compatible with this new system. The Department prefers that all data be entered into the Department's new data exchange system which should be ready to receive data this Spring. Organizations wishing to submit data for use in the 2010 Integrated Report were requested to fill out the web form under "Data Solicitation" at [www.state.nj.us/dep/wms/bwqsa/2010\\_integrated\\_report.htm](http://www.state.nj.us/dep/wms/bwqsa/2010_integrated_report.htm). The Department intends to work with potential data submitters on how to submit the data to the Department. Volunteer organizations may also utilize the Department's new data management system for volunteer monitoring data located on the Department's Web site at <http://www.state.nj.us/dep/wms/bfbm/vm/database.html>.

##### **Locational Data**

Accurate locational data are required to ensure comparison to appropriate SWQS, as well as confirming that sampling stations are located outside of regulatory mixing zones. Digital spatial data in the form of a Geographical Information System (GIS) shape file or Global Positioning System (GPS) coordinates, or latitude/longitude information, must be provided for all monitoring station locations, which must be accurate to within 200 feet. Only sampling stations that are spatially referenced will be used to develop the Integrated List.

## Quality Assurance

The Department maintains a strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs. All data and information used to develop the Integrated Report must comply with the Department's Quality Assurance Guidelines, the Department's field sampling procedures, and be analyzed by a certified laboratory. Department policy mandates that all environmental data collection activities performed (or for use) by the Department comply with and be accompanied by an approved Quality Assurance Project Plan (QAPP). QAPPs describe the procedures used to collect and analyze samples and review and verify the results to assure high quality data. QAPPs must be approved by the Department, USEPA or USGS. All data generated by the Department complies with the Department's QAPP, which has been approved by USEPA.

All data submitted to the Department in response to the data solicitation for the Integrated Report must comply with a Department-approved QAPP. The QAPP must be approved by the Department's Office of Quality Assurance prior to the start of any sampling and should comply with USEPA's QAPP guidance document, available on the USEPA Web site at [http://www.epa.gov/region02/qa/qa\\_documents/air\\_h20\\_qapp04.pdf](http://www.epa.gov/region02/qa/qa_documents/air_h20_qapp04.pdf). The Department also provides guidance for developing QAPPs for volunteer monitoring data, available on the Department's Volunteer Monitoring Program Web site at [http://www.state.nj.us/dep/wms/bfbm/vm/quality\\_assurance.html](http://www.state.nj.us/dep/wms/bfbm/vm/quality_assurance.html). Additional information about the Department's QAPP process is available on the Department's Web site at <http://www.nj.gov/dep/oqa/>. Entities responsible for generating the data are responsible for compiling the data, completing a detailed quality assurance review, and addressing questions regarding the data set.

The sampling protocol for data used in the Integrated Report must also comply with the procedures in the Department's Field Sampling Procedures Manual (NJDEP, 2005) or follow equivalent field procedures as determined by the Department's Office of Quality Assurance. The Department's Manual includes approved procedures for sample collection, field quality assurance, sample holding times, and other data considerations and is available for download from the Department's Web site at <http://www.state.nj.us/dep/srp/guidance/fspm/>). Samples must be analyzed at a laboratory certified by the Department's Office of Quality Assurance, or a federal laboratory (e.g., the USGS National Water Quality Laboratory in Denver) using analytical methods or their equivalents, as certified by the Department pursuant to N.J.A.C. 7:18, USEPA, or USGS.

### 3.2 Criteria and Policies

Since water quality data are assessed for compliance with the Surface Water Quality Standards (SWQS), the SWQS provide the foundation for the Integrated List. The SWQS establish surface water classifications, the designated uses associated with the surface water classifications, and the criteria and policies established to protect, maintain, and restore the designated uses.

**Antidegradation Policy:** The SWQS contain an antidegradation policy that applies to all surface waters of the State. Antidegradation is a requirement under the federal Clean Water Act designed to prevent or limit future degradation of the nation's waters. Under this policy, existing uses shall be maintained and protected. Designated uses shall be maintained or, as soon as technically and economically feasible, be attained wherever these uses are not precluded by natural conditions. No irreversible changes may be made to existing water quality that would impair or preclude attainment of the designated use(s) of a waterway. No changes shall be allowed in waters that constitute an outstanding national or state resource or in waters that may affect these Outstanding National Resource Waters. The Department applies the antidegradation policy in tandem with the classification of the receiving waterbody in making decisions about proposed new or expanded discharges to surface waters, including stormwater permits, as well as certain land use permits. Additional information about the SWQS antidegradation policy is available on the Department's Web site at <http://www.state.nj.us/dep/wms/bwqsa/swqs.htm>.

**Narrative Water Quality Criteria:** Narrative water quality criteria are non-numeric descriptions of the conditions necessary for a waterbody to attain its designated uses. To implement narrative data, which is qualitative in nature, the Department has identified assessment approaches, also known as "translators", to quantitatively interpret narrative criteria. New Jersey's SWQS contain narrative criteria for toxics, nutrients, natural conditions, and antidegradation.

Toxics: The SWQS contain two narrative criteria for toxic substances:

1. None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota, produce undesirable aquatic life, or which would render the waters unsuitable for the desired use; and
2. Toxic substances shall not be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate within the organism to concentrations that exert a toxic effect on that organism or render it unfit for human consumption.

The Department uses several translators to assess compliance with the narrative toxic criteria. These translators include: fish consumption advisories (see Section 6.3, Fish Consumption Use Assessment); shellfish closure data (see Section 6.4, Shellfish Use Designated Use Assessment); source water information (see Section 6.5, Drinking Water Supply Use Assessment) with regard to human health; and biological data (see Section 6.1, Aquatic Life Use Assessment) with regard to aquatic life.

Nutrients: The SWQS include narrative nutrient policies at N.J.A.C. 7:9B-1.14(d)5 that apply to all freshwaters of the State, in addition to the applicable numeric criteria. The narrative nutrient policies prohibit nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation, or render waters unsuitable for designated uses. Section 4.4 details the interpretation of this narrative criterion.

**Natural Conditions:** The SWQS at N.J.A.C 7:9B-1.5(c) state, “Natural water quality shall be used in place of the promulgated water quality criteria of N.J.A.C. 7:9B-1.14 for all water quality characteristics that do not meet the promulgated water quality criteria as a result of natural causes.” The concept of “natural causes” is applied when the Department can document that there are no anthropogenic sources or causes of a given characteristic or that the characteristic is clearly attributable to the natural conditions of the waterbody. Data that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated. When the Department identifies a general area where natural conditions apply, it will discuss the assessment process in the Methods Document.

**Numeric Water Quality Criteria:** The surface water quality criteria established for each of the different surface water classifications in the SWQS are numeric estimates of constituent concentrations, including toxic pollutants, that are protective of the designated uses. Numeric surface water quality criteria have been established for conventional parameters (e.g., dissolved oxygen, pH, temperature), toxics (e.g., metals, organics, unionized ammonia), and sanitary quality (e.g., pathogens). Additional information about numeric water quality criteria is available on the Department’s Web site at <http://www.state.nj.us/dep/wms/bwqsa/swqs.htm>.

## 4.0 Evaluation of Data at the Station Level

### 4.1 Physical and Chemical Data

The Department assesses physical and chemical data for which criteria have been established in the SWQS. Conventional physical and chemical parameters include dissolved oxygen, pH, , total suspended solids, total dissolved solids, sulfate, temperature, chloride, and nitrate. Toxic parameters include un-ionized ammonia, metals, and various organic compounds. Un-ionized ammonia is calculated from total ammonia concentrations using pH and temperature at the time of sampling. Chemical parameters are assessed for conformance with the applicable numeric SWQS criteria. Total phosphorus is assessed for conformance with the narrative SWQS nutrient criteria.

**Analytical Precision and Accuracy:** The Department will take into consideration the precision and accuracy of the analytical method used to measure the data. When the precision and accuracy is at the level of the criteria, and the sample result is within the margin of error of the analytical method, the sample result will not be classified as an exceedance of the criterion.

**Continuous Monitoring:** More and more frequently, instruments such as Datasondes are being deployed to continuously monitor the water. The parameters most commonly measured in this fashion are water temperature and dissolved oxygen (DO). The protocol for comparing these data to the SWQS criteria is as follows:

**Dissolved Oxygen:** The SWQS criteria for DO are expressed as either a minimum, “not less than...at any time” concentration over a 24-hour period or as a 24-hour average concentration. For the “not less than...at any time” criterion, the lowest value from each 24-hour period is compared to the criterion. An exceedance occurs when the DO criterion is not met for two or more recording intervals, each equaling a duration of least one hour long during a 24-hour period. When comparing the data to a criterion expressed as a 24-hour average, all the individual subsamples for a 24-hour period are combined to determine the average concentration. An exceedance occurs when the 24-hour average violates the 24-hour average criterion.

When the data are combined into each assessment unit (see Chapter 5), the use is assessed as not attained when there are two exceedances of the minimum DO criterion on different days within the same data set or when two 24-hour average concentrations violate the 24-hour average criterion at the same station.

**Temperature:** The Department proposed to replace the existing seasonal average temperature criteria on April 20, 2009 with acute and chronic criteria to better protect the State’s cold and warm water fisheries (see table 4.1). As with the current temperature criteria of a summer seasonal average (June 21 – September 21), these new criteria make extensive use of continuously recorded temperature data. The use of continuous data, with recordings taken anywhere between once per hour to every 15 minutes for weeks at a time, allow the Department to calculate a relevant seasonal average (current criteria) or

a 7 day average of the daily maximum (proposed) and observe critical periods of elevated temperatures over the entire critical summer period.

When evaluating continuous monitoring data under the proposed acute criteria (see Table 4.1), the “not to exceed” maximum criterion will be compared to a maximum temperature with a one hour duration. Two such exceedances on two separate days must be recorded within the period of review (up to 5 years) for temperature to be exceeding the SWQS..

The proposed 7 day average of the daily maximum criteria will be compared to the average of 7 daily maximum temperatures calculated as rolling averages through the summer season. Table 4.1 shows the proposed temperature criteria.

**Table 4.1 Proposed Temperature Criteria**

<b>Classification</b>	<b>Acute</b>	<b>Chronic</b>	<b>Summer Season</b>
	1 hour maximum	7 day average	
FW2-TP	22 <sup>0</sup> C	19 <sup>0</sup> C	
FW2-TM	25 <sup>0</sup> C	23 <sup>0</sup> C	
FW2-NT	31 <sup>0</sup> C	28 <sup>0</sup> C	
SE			29.4 <sup>0</sup> C
SC			26.7 <sup>0</sup> C

Note that at locations where only grab samples are available, the sites will be evaluated based upon the acute criterion only.

**Computations Using Censored Data:** Censored data are data with concentrations that are less than the minimum reporting level of an analytical procedure. These data are usually labeled with a “<” symbol followed by the reporting limit in the data report received from the laboratory. When calculating averages, these values are set to one-half of the reporting limit. If the criterion and sample concentration are both below the minimum reporting level (i.e., non-detect), an exceedance of the criterion can not be established.

**Design Flows:** Design flows are specified in the SWQS at N.J.A.C. 7:9B-1.5(c). Samples should be collected when streams are at or above design flows, as specified for the applicable numeric SWQS criteria. Flow data will be reviewed when an exceedance of a criterion is observed to determine whether the data was collected under appropriate flow conditions. For regulatory purposes, numeric criteria apply only during the specified design flow; therefore, any data that are collected when stream flows are below “design flows” are not considered valid data for assessment (or enforcement) purposes.

**Duration (Exposure Periods):** The SWQS includes criteria-specific exposure periods (durations) that range from one hour to 70 years. In assessing compliance with the SWQS, the Department takes into consideration the specific duration applicable to the criterion for the parameter being assessed. For toxic substances, the Department uses the duration of chronic aquatic life and human health carcinogen criteria. For all other criteria, an individual datum is

assumed to extend over the applicable duration, providing a more conservative assessment. For chronic aquatic life criteria, which have a four-day exposure period, data collected only under high flow conditions lasting less than four days are not considered valid for assessment purposes because the duration specified in the SWQS has not been met. For human health carcinogen criteria, the Department calculates a long term average of all data available for the most recent five-year period for comparison to the criterion.

**Frequency of Exceedance:** The Department has determined that a minimum of two exceedances of a numeric SWQS criterion over a given five-year period is necessary to confirm noncompliance with the criterion for non-toxic parameters. The Department has determined that a second exceedance is necessary to ensure that the first exceedance was not a transient condition or a result of sampling or analytical error. For toxic substances, noncompliance with the applicable SWQS criteria is confirmed by a minimum of two exceedances of an aquatic life criterion over three years, or when the long-term average concentration (see Duration, above) exceeds a human health carcinogen criterion. The SWQS identify which toxic substances have aquatic life criteria and which have human health carcinogen criteria in the table of Surface Water Quality Criteria for Toxic Substances (see N.J.A.C. 7:9B-1.14(f)7). When the minimum exceedance is met but the dataset is very large (more than 30 data points), the Department will consider the relative frequency and magnitude of the exceedances within the dataset and use Best Professional Judgment to determine if they represent non-attainment of the designated use. The Integrated Report will include an explanation of any assessment which concludes that the use is attained because of relatively low magnitude or frequency of exceedances in a very large dataset.

**Minimum Number of Samples:** Unless described differently for a particular parameter, the minimum data set consists of eight samples. The Department prefers that the period over which the samples are collected is two years, with samples collected quarterly (to capture seasonal and flow variations). These recommendations are intended to ensure that existing water quality conditions are accurately portrayed by the data, that the data do not characterize transitional conditions, and that obsolete data are not used. If data submitted do not meet these recommendations, then the Department will consider the data set on a case-by-case basis to determine if the data adequately characterizes the water quality conditions. Summer-only sampling for nutrients, pathogenic quality, and temperature may be acceptable since summer generally represents the critical condition for these parameters. If the Department determines that the data does not adequately represent the water quality conditions, the data will not be used in for assessment purposes. If the Department determines that the data set does adequately represent water quality condition and there are at least two exceedances of the Surface Water Quality Standards, this limited data set will be used to determine that a use is not attained.

**Metals:** SWQS criteria for metals include human health (HH), acute aquatic life (AQLa), and chronic aquatic life (AQLc). HH criteria are based on the total recoverable (TR) form of the metal to protect human health from all forms of the metals. To the extent available, total recoverable (TR) and dissolved fraction (DF) data will be compared to the TR and DF criterion, respectively. When only TR data are available, in addition to comparing the TR concentration to the TR criterion, the Department will also compare the TR concentrations to the DF criterion. If the TR concentrations are below the DF criterion, the Department assumes the DF criterion is also met. TR concentrations above the DF criterion will trigger additional sampling for DF.

**Outliers:** Any data that is identified as an outlier in accordance with the corresponding QAPP is not considered a valid result and is not used in for assessment purposes.

**Significant Figures:** Significant figures are the number of reliably known digits used to locate a decimal point reported in a measurement. Proper use of significant figures ensures that the uncertainty of the measurement is correctly represented. When assessing data, the Department will limit the significant figures to that associated with the SWQS being assessed, with one exception. The numeric criterion for total phosphorus in lakes has two significant figures (0.05 mg/L) but the numeric criterion for total phosphorus in rivers has one significant figure (0.1 mg/L). Since the analytical methods and level of uncertainty are the same for a sample regardless of which criterion applies, the Department will always use two significant figures when assessing total phosphorus.

**Subsamples:** When data are collected in a vertical or horizontal cross section, or at several locations in close proximity to each other, the data may be combined and assessed as one sample. The individual “subsamples” are assessed as follows: when comparing data to a “not to exceed at any time” criterion, the sample is represented by the worst case subsample. When comparing the data to a criterion based on an average, all of the individual samples are combined to determine the average.

**Unusual Events:** All samples indicating an exceedance of the SWQS will be reevaluated by the Department to determine if the results can be attributed to an unusual event such as a pipe break, spill, plant upset, or severe weather. The Department will exclude any sample results collected under a verified unusual event as not representative of the normal range of water quality.

**Lake Assessments:** Lake are monitoring as per the Department’s Ambient Lakes Monitoring Program (see <http://www.state.nj.us/dep/wms/bfbm/lakes.html>). Lakes are assessed based upon chemistry data collected just below the surface (generally at a one meter depth if the lake is sufficiently deep). Data used is restricted to in-lake data and not samples collected at the outfall. Lakes are assessed for Aquatic Life Support Use based upon total phosphorus, dissolved oxygen, and pH recordings.

## 4.2 Pathogenic Indicators

Waters classified as PL, FW, SE1, and SC will be assessed for primary contact (“in the water”) and SE2 and SE3 waters will be assessed for secondary recreation (“on the water”). Assessment for recreation compares the geometric mean (geomean) of the water quality data for pathogenic indicators to the appropriate SWQS criterion. At least five samples collected over a 30-day period are required to calculate the geomean; however, other sampling frequencies may be acceptable provided that the frequency supports the statistical method for calculating a geomean. Data collected weekly for more than one month will result in one geomean. Data collected at 5/30 day for several years will be combined to calculate single geomean. All sanitary data

collected as per the requirements of the geometric mean are used to assess the recreational use, in water both with and without bathing beaches (including coastal waters).

In addition to assessing primary contact recreation in all PL, FW, SE1, and SC waters using geometric mean, a second assessment is conducted for “designated bathing beaches”. "Designated bathing beaches" include beaches that are heavily used for primary contact recreation such as swimming, bathing, and surfing during the recreational season pursuant to the New Jersey State Sanitary Code N.J.A.C. 8:26. Designated bathing beaches are assessed as attaining primary contact recreation if there are no beach closures lasting seven or more consecutive days in a given year, or the average number of beach closures is less than two per year over a five-year period. Beach closure procedures are established at N.J.A.C. 8:26-8.8, which is available on the U.S. Department of Health’s Web site at <http://www.state.nj.us/health/eoh/phss/recbathing.pdf>.

Designated bathing beaches must be sampled at least once a week to protect the public health, usually every Monday. Any sampling event that indicates noncompliance with the pathogen criterion results in a beach closure until a second sample is taken, usually the following Wednesday. In assessing designated bathing beaches the Department will review the beach closure data to determine if any closures were transient anomalies, laboratory error, or due to other than water quality issues, in which case the data would not be used in the assessment. Short term beach closures of less than a week (Monday through Wednesday) generally signify occasional excursions of the pathogen criterion, unless the short term closures occur chronically over several (five or more) years, in which case the beach is assessed as impaired. A week-long beach closure signifies that noncompliance with the pathogen criterion occurred more than once within one week. One beach closure lasting seven or more consecutive days in a given year, or an average of two or more beach closures (of any duration) per year over a five-year period, is assessed as an impairment.

Recreational use assessment methods are explained in detail in Section 6.2.

### 4.3 Biological Data

The Department has developed biological indicators (benthic macroinvertebrates and fin fish) to evaluate aquatic life use attainment (in concert with chemical/physical data) and to evaluate the Department's narrative nutrient criteria.

**Benthic Macroinvertebrate Data:** New Jersey has been using biological metrics to evaluate biological conditions in freshwater streams since the early 1990s. Prior to the 2008 Integrated Report, macroinvertebrate data collected under New Jersey's Rapid Bioassessment Protocol (RBP) were evaluated using the New Jersey Impairment Score (NJIS) system for all freshwater streams. Assessments were based upon family level taxonomy with three condition categories: not impaired, moderately impaired, and severely impaired. Starting with the 2008 Integrated Report, the Department will use three new biological indices based upon genus level taxonomy. The three indices were developed for different physiographic regions of the State: the High Gradient Macroinvertebrate Index (HGMI), which applies to the streams of northern ecoregions (Highlands, Ridge and Valley, and Piedmont); the Coastal Plain Macroinvertebrate Index (CPMI), which applies to the Coastal Plain (excluding waters considered Pinelands waters); and the Pinelands Macroinvertebrate Index (PMI), which applies to PL waters contained within the jurisdictional boundary of the Pinelands as well as FW2 waters within five kilometers of the Pinelands Area boundary (see Figure 4.3).

Table 4.3 lists the scores for each metric and their associated condition category. The new indices have four condition categories: excellent, good, fair, and poor. Scores aligning with the "excellent" and "good" categories are assessed as not impaired while scores in the "fair" and "poor" categories are assessed as biologically impaired, with one exception. For the new PMI, scores in the fair category are assessed as impaired if the waters are classified as PL but are assessed as not impaired if the waters are classified as FW2. This is because the PMI was developed specifically to reflect the unique conditions of nondegradation PL waters. The Department will continue to accept NJIS family level assessments; however, genus level assessments will be used in lieu of family level assessments when both are available for the same location.

**Fin Fish Data - Fish Index of Biotic Integrity (FIBI):** Fin fish population data are assessed using the Fish Index of Biotic Integrity (FIBI). A more detailed description of the FIBI program, including sampling procedures, is available on the Department's Web site at <http://www.state.nj.us/dep/wms/bfbm/fishibi.html>. The current FIBI metric applies to high gradient streams above the fall line (Highlands, Ridge and Valley, and Piedmont physiographic provinces). This metric has four assessment result categories: excellent, good, fair, and poor. Scores in the "excellent", "good", and "fair" categories indicate that biology is not impaired while scores in the "poor" category indicates that the biology is impaired. Work is continuing to evaluate impairment thresholds for FIBI data.

**Figure 4.3: Spatial Extent of Application for Each of the Benthic Macroinvertebrate Indices Applied in New Jersey**

Region Assessed by High Gradient Macroinvertebrate Index (HGMI)



Region Assessed by Pinelands Macroinvertebrate Index (PMI)



Region Assessed by NJ Impairment Score (NJIS)\*



Region Assessed by Coastal Plain Macroinvertebrate Index (CPMI)



\* NJIS is no longer used by the Department but may be used by other entities

**Table 4.3: Descriptive and Regulatory Thresholds for Biological Metrics\***

<b>Macroinvertebrate Index for High Gradient Streams (HGMI Metric) (Highlands, Ridge and Valley, Piedmont Physiographic Provinces)</b>		
<b>Category</b>	<b>Metric Score</b>	<b>Assessment</b>
Excellent	63 - 100	Not Impaired
Good	42 - < 63	Not Impaired
Fair	21 - < 42	Impaired
Poor	< 21	Impaired

**Macroinvertebrate Index for Low Gradient (CPMI Metric)  
Coastal Plain (Non Pinelands) Streams**

<b>Category</b>	<b>Metric Score</b>	<b>Assessment</b>
Excellent	22 - 30	Not Impaired
Good	12 - 20	Not Impaired
Fair	10 - 6	Impaired
Poor	< 6	Impaired

**Macroinvertebrate Index for Pinelands Waters (PMI Metric)**

<b>Category</b>	<b>Metric Score</b>	<b>Assessment Result</b>
Excellent	63 - 100	Not Impaired
Good	56 - < 63	Not Impaired
Fair	34 - < 56	PL waters: Impaired FW2 Waters: Not Impaired
Poor	< 34	Impaired

**New Jersey Macroinvertebrate Index (NJIS)**

<b>Category</b>	<b>Metric Score</b>	<b>Assessment Result</b>
Not Impaired	24 - 30	Not Impaired
Moderately Impaired	9 - 21	Impaired
Severely Impaired	0 - 6	Impaired

**Fish Index of Biotic Integrity (FIBI)  
(Highlands, Ridge and Valley, Piedmont Physiographic Provinces)**

<b>Category</b>	<b>Metric Score</b>	<b>Assessment Result</b>
Excellent	45 - 50	Not Impaired
Good	37 - 44	Not Impaired
Fair	29 - 36	Not Impaired
Poor	10 - 28	Impaired

\*Source: Standard Operating Procedures Ambient Biological Monitoring Using Benthic Macroinvertebrates Field, Lab, Assessment Methods (NJDEP, 2007), available on the Department's Web site at [http://www.state.nj.us/dep/wms/bfbm/download/AMNET\\_SOP.pdf](http://www.state.nj.us/dep/wms/bfbm/download/AMNET_SOP.pdf).

**Regional Monitoring and Assessment Program (REMAP) Assessments:** A Benthic Index of Biotic Integrity was developed for the New York/New Jersey Harbor based on USEPA Region 2's REMAP protocol and data reflecting benthic invertebrate communities. The results are used to assess the waters of Raritan Bay, the Arthur Kill, and the Kill van Kull. This index was developed by scoring each of five metrics as 5, 3, or 1. Overall index scores less than 3 are considered biologically impaired while scores greater than 3 are considered not impaired. Additional information about this metric is available on the USEPA Web site at <http://www.epa.gov/emap/remap/html/docs/nynjsedapp1.pdf>.

### **Additional Considerations When Evaluating Biological Data**

Disturbed or impaired biota can result from extended drought or other conditions that result in reduced base flow. If biological communities are impaired due to drought-induced, low flow conditions, the impairment will be attributed to natural conditions and the data will not be considered valid for assessment purposes (see Section 3.2).

Many aquatic life use assessments are based on biological indices for benthic macroinvertebrate (e.g., PMI) and for fin fish populations (i.e., FIBI). These biota differ from one another in sensitivity to pollutants as well as in their individual temporal and spatial scales. Thus, assessment results may differ for fish and invertebrates at the same location. If at least one data set is assessed as impaired, the entire site will be assessed as impaired.

#### **4.4 Assessment for nutrient (Total Phosphorus) impacts**

This section describes the new assessment method used to evaluate compliance with the narrative criteria proposed at N.J.A.C. 7:9B-1.14(d)5 and to determine whether phosphorus is present at levels which cause aquatic life impairment as a result of excessive nutrient enrichment. Note that this is not a “designated use” assessment but rather a “cause” analysis used to determine whether phosphorus is pollutant of concern resulting in non-attainment of the aquatic life use. See Chapter 6 for designated use assessment methods.

Biological data (benthic macroinvertebrate and/or fish IBI data) in concert with in-stream dissolved oxygen (DO) data will be assessed to determine whether phosphorus is or is not at levels which indicate impacts due to nutrient enrichment. However, the Department recognizes that there may be situations where the data is inconclusive due to site-specific factors, such as stream velocity which could preclude dissolved oxygen levels exceeding the SWQS. In these cases, further analysis will be needed to determine whether or not phosphorus should be identified as a cause. The Department will evaluate chlorophyll *a* data to determine if the periphyton biomass is excessive. If the results indicate excessive chlorophyll *a*, then the Department will conclude that phosphorus is present at levels that indicate impacts due to nutrient enrichment.

DO will be assessed in terms of (i) the applicable criteria based upon the waterbodies classification in the Surface Water Quality Standards (N.J.A.C. 7:9B) and (ii) a change in DO concentration occurring over a 24 hour period (diurnal DO flux). The Department has

determined that fluctuations of 3 mg/l provide a strong indication that excessive daytime photosynthesis is occurring at the site.

The specific procedures for assessing DO conditions are as follows. Dissolved oxygen levels are compared to the appropriate surface water quality criteria as described in section 4.1: Dissolved Oxygen under “Continuous Monitoring.” For the purposes of assessing *diurnal* DO Flux, the Department will review the results from continuous monitoring performed during the growing season. If the diurnal DO flux is 3 mg/l or greater in two 24 hour periods, whether occurring in a single deployment *or* a single 24 hour period in two or more deployments, than the Department will conclude that DO swing is excessive.

In situations where this assessment is **inconclusive**, the Department will review chlorophyll *a* data. If the seasonal average Chlorophyll *a* concentration from a minimum of three sampling events exceeds 150 mg/sq. meter the Department will conclude that phosphorus exceeds the narrative criteria.

The Chlorophyll *a* threshold is based upon USEPA observations that below these thresholds many of the adverse effects attributed to dense algal growth (e.g. degradation of benthic habitat, restricted intragravel water flow and DO replenishment, etc.) can be avoided (USEPA, 2000a). These chlorophyll *a* measurements represent supplemental data used in cases when biological data show non attainment but chemistry data show no clear problems (Table 4.4).

Scenarios where the biological indices indicate impairment, the assessment unit will be listed as impaired for aquatic life because the biological data by themselves are non-attaining. In such cases when phosphorus is determined to be a cause of aquatic life impairment, phosphorus will be listed on 303(d) list. In cases where phosphorus is found to meet the narrative criteria and therefore *not be the cause* if impairment, another parameter such as DO (if in exceedance of standards) or “cause unknown” will be identified on the 303(d) list.

Waterbodies Previously for Phosphorus: Listed Waterbodies listed on the 2008 303(d) for phosphorus based upon the 0.1 total phosphorus level will be reevaluated using the new protocol and will be delisted if it is determined that the level of phosphorus present does not cause a violation of the narrative criteria.

**Table 4.4: Phosphorus Assessment**

<b>Results of Biological Assessment</b>	<b>Dissolved Oxygen</b>	<b>Results of Phosphorus Assessment</b>
Biological Index show attainment	No exceedances of criteria, Swing inconsequential in this scenario	no phosphorus impacts
	Exceedances of criteria, No excessive swing	no phosphorus impacts
	Exceedances of criteria, Excessive swing present	If Biological Index = “Excellent” – no phosphorus impacts – natural condition  If Biological Index = “Good” – <b>phosphorus impact inconclusive</b>
Biological Index show non attainment	No exceedances of criteria, No excessive swing	<b>Phosphorus impact inconclusive.</b>
	No exceedances of criteria, Excessive swing present	<b>Phosphorus impact inconclusive.</b>
	Exceedances of criteria, No excessive swing	no phosphorus impacts
	Exceedances of criteria, Excessive swing present	phosphorus impacts present
	Chemistry data not available	<b>Phosphorus impact inconclusive</b>

## 5.0 Evaluating Data from Multiple Stations within an Assessment Unit

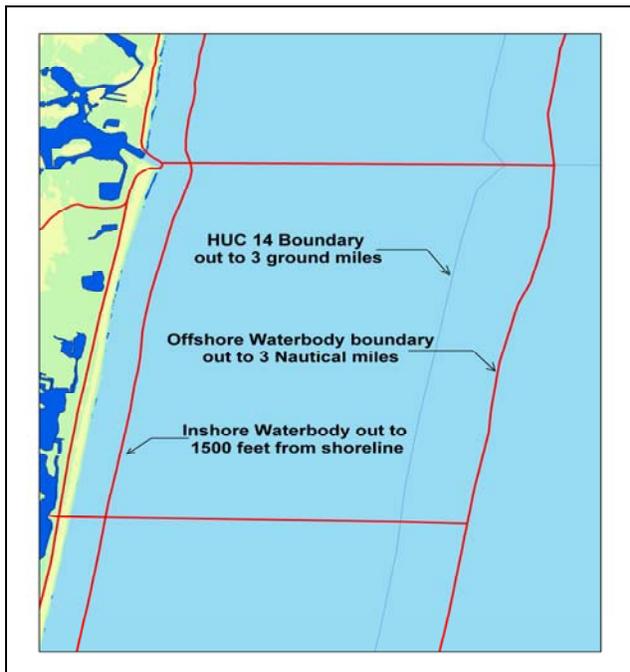
While the initial data evaluation is conducted at the station level, use assessments are conducted for entire assessment units, each of which may contain data from multiple stations. All data from one or more monitoring stations located within a given assessment unit are extrapolated to represent all waters within that assessment unit's boundaries.

**Assessment Units:** New Jersey's assessment units are delineated based on Hydrologic Unit Code (HUC) 14 subwatershed boundaries except for the Delaware River mainstem, Estuary, and Bay, where assessment units are delineated based on DRBC designated zones. HUCs are geographic areas representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by USGS in cooperation with the National Resources Conservation Service (NRCS). The HUC system starts with the largest possible drainage area and progressively smaller subdivisions of that drainage area are then delineated and numbered in a nested fashion. There are currently 950 HUC 14 subwatersheds in New Jersey. HUC 14 subwatersheds range in size from 0.1 to 42 square miles, with an average size of 8.5 square miles. The Department's GIS database contains a coverage containing discrete polygons for each of New Jersey's 950 HUC 14 subwatersheds. Since the Integrated Report also addresses the 20 Delaware River zones designated by DRBC, there are a total of 970 assessment units assessed in the Integrated Report.

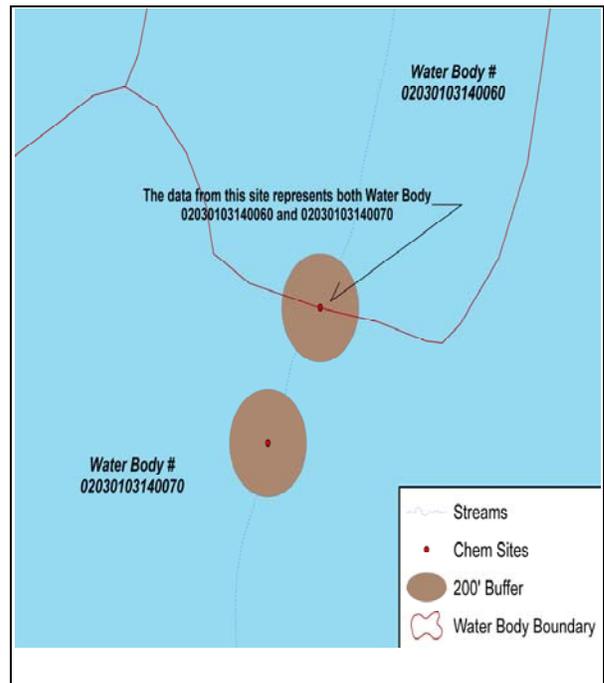
The identification number (ID) for each HUC 14 assessment unit was created by adding a two-digit ID number to the end of the 14-digit HUC code for that subwatershed. The boundary of HUCs located along the shore were extended from three statute miles to three nautical miles, which represents the jurisdictional waters of the State of New Jersey. The Department decided to split some HUC 14 polygons into smaller, more homogeneous assessment units. The newly divided assessment units are now identified with "01" and "02" extensions. The new HUCs have the original assessment unit name but with one of the following terms added: "upstream" or "downstream" (for rivers), "inshore" or "offshore" (along the coast). The ocean HUCs are divided into a near shore assessment unit extending perpendicular to the shore 1500 feet out and an offshore area extending from 1500 feet to the three nautical mile boundary. The inshore assessment unit represents the outward extent of the designated bathing beaches along the Atlantic Coast (Fig. 5a).

**Station Representation:** The Department will evaluate station locations on a case-by-case basis to determine if the data from these stations should be used in assessing the adjacent assessment unit (AU). For example, it is common for monitoring sites to be placed at the terminus of one assessment unit as it flows into an adjacent assessment unit. When a monitoring site falls within 200 feet of a given assessment unit boundary, the assessment based upon that site is applied to both the assessment unit containing the site and to the adjacent assessment unit (Fig 5b). This assignment is made provided that there are no significant tributaries, impoundments, or other hydrological alterations that could impact water quality between the monitoring site and the neighboring assessment unit. If there are no applicable monitoring stations for an assessment unit, the unit will be identified as not assessed (sublist 3).

**Figure 5a: Offshore HUC Extensions**



**Figure 5b: Station Representation**



## **Additional Considerations When Combining Data from Multiple Stations within an Assessment Unit**

**Assessment Units With More Than One Stream Classification:** Data will be compared to the SWQS for the stream classification where the station is located. Where data is available for both higher and lower classification streams, the Department will use the more stringent criteria to assess designated use attainment for the assessment unit. For example, if the assessment unit contains both FW2-TM (trout maintenance) and FW2-NT (non-trout) waters, and the DO criteria are met for the FW2-NT waters but not met for the FW2-TM waters, the results for the more stringent trout maintenance criteria will be applied and the entire assessment unit will be assessed as not attaining the aquatic life use.

Where the assessment unit contains both higher and lower classification streams but there is no data for the higher classification stream segment, then data from a station located outside of the higher classification waters will be compared to the SWQS for that classification. If the lower classification waters meet the higher classification's SWQS, the data will be used to assess both classifications. However, if the data collected at the station in a lower classification does not meet the higher classification's SWQS, the assessment unit will be considered to have insufficient data with which to assess the higher classification and the assessment unit will be assessed as attaining only the general aquatic life use.

**Continuous Monitoring and Grab Sampling:** Grab samples collected quarterly may not capture the most critical time period; therefore, they may not reflect the worst case scenario for use attainment. Thus, the Department will give more weight to continuous monitoring data, provided that the continuous monitoring data is available for at least a single season.

**De minimus:** When evaluation of data at a station level identifies portions of an assessment unit as impaired but, upon further evaluation, these stations represent minute portions of the total area of the assessment unit, the Department will regard the assessed area as *de minimus* rather than impaired. The concept of *de minimus* is applied to numerous situations when evaluating assessment units. Examples of situations where a *de minimus* determination would be applied are as follows:

Recreational use assessments: Where one bathing beach is impaired but several others in the same assessment unit are not, the Department will consider the water quality of the non-bathing beach areas and the frequency and duration of the closures at the one impaired beach in assessing recreational use attainment for the entire assessment unit. Where an assessment unit contains one or more impaired bathing beaches but the spatial extent of the impaired bathing beaches is a minute portion of the assessment unit, the impairment would be considered *de minimus* and would not be considered in assessing recreational use attainment for the entire assessment unit. When determining the spatial extent, a designated bathing beach represents the area within 1,500 feet from the shoreline in the saline coastal (SC) waters, and the area within 200 feet from the shoreline in saline estuarine (SE1) waters. In these instances, where the Department uses Best Professional Judgment and determines that the impairment is *de minimus*, the individual

impaired bathing beaches will be identified in the Integrated Report for follow up sanitary surveys required by the DHSS.

Shellfish harvest use assessments: Assessment units overlie but do not follow shellfish classification boundaries. As a result, an assessment unit may include several different shellfish classifications. In most instances, the use assessment will be based on the most restrictive classification found within the assessment unit. In the few instances where only a very small portion of the acreage within the assessment unit is has some degree of restriction, the use assessment will be based on assessment of the larger area. Any *de minimus* areas that are restricted but are not subject to administrative closures (i.e., the restriction is due to poor water quality) will be identified in the Integrated Report.

**Evaluating Contradictory Data Sets:** Weighing data is necessary when evaluating numerous data sets that have different data collection and analysis methods, or have temporal or spatial sampling variability. These decisions will apply in the following situations: newer data will override older data; larger data collection sets might override or be combined with nominal data sets; and higher quality data will override data sets of lower quality based on sampling protocol, equipment, training and experience of samplers, quality control program, and lab and analytical procedures. If the Department bases its use assessment on one set of data over another, the specific rationale applied will be explained in the Integrated Report.

**Macroinvertebrate Metrics, Use Of Family Level Indices Vs. Genus Level Indices (NJIS vs. CPMI and HGBI):** As stated earlier in Section 4.3, the Department will continue to use biological assessment results based on the family level macroinvertebrate NJIS index in non-Pinelands waters, if they are submitted by other entities; however, where assessment results based upon the newly developed, genus level metrics (HGBI and CPMI) are available, these results will override those based upon family level metrics when assessing aquatic life use attainment for the entire assessment unit.

**Modeling and Sampling Results:** Water quality models may be used to predict changes in water quality over time under different flow, weather, and temporal conditions. In considering use of modeling results (such as those generated in TMDL studies) to assess compliance with SWQS criteria, the Department will evaluate the results on a case-by-case basis to determine if they should be considered with equal weight as actual sampling data.

**Shellfish Classification Data:** The Department will review shellfish classification data to determine if the harvest restrictions were transient anomalies or a result of something other than water quality issues. The Department will further evaluate the data to ensure that harvest restrictions are not attributed to a specific event requiring enforcement action such as a pipe break, spill, or treatment plant upset. Shellfish harvesting restrictions based on transient anomalies are not considered impairments and are not considered in assessing the shellfish harvest use. Restrictions attributed to events requiring enforcement action will be assessed as not attaining the shellfish harvest use but will not require a TMDL.

## 6.0 Use Assessment Methods

The SWQS identify specific designated uses for the waters of the State according to their waterbody classifications. Designated uses include:

- aquatic life (general and trout);
- recreation (primary and secondary contact);
- fish consumption;
- shellfish harvest (for consumption);
- drinking water supply;
- industrial water supply; and
- agricultural water supply.

The Department uses both numeric and narrative criteria to protect designated uses. Numeric criteria are estimates of constituent concentrations that are protective of the designated uses. Narrative criteria are non-numeric descriptions of conditions to be attained/maintained or avoided. To implement narrative data, which are qualitative in nature, the Department has identified assessment approaches, also known as “translators”, to quantitatively interpret narrative criteria. This section outlines the assessment methodologies for designated use attainment that include the utilization of both numeric and narrative criteria and involves the integration of data for multiple parameters at multiple stations for each assessment unit.

The Department has identified the parameters that are used to assess each designated use (see Appendix A). Sufficient data for every parameter are not always available; therefore, a minimum suite of parameters necessary for assessing each designated use has also been specified. Table 6.0 identifies the minimum suite of parameters necessary to assess each designated use. However, data for the entire minimum suite of parameters are only necessary to conclude that the designated use is attained. Specifically, an assessment unit will be assessed as attaining the designated use if data for the entire minimum suite of parameters are available and the data indicate that there are no impairments or exceedances (Sublist 1 or 2). If data for any one parameter associated with a designated use (Appendix A parameters) indicate any impairment or exceedance, even if data are available for only some of the minimum suite of parameters, then the assessment unit will be assessed as not attaining the designated use (Sublist 4 or 5). If data are available for only some of the minimum suite of parameters and the data indicate that there are no impairments or exceedances, then the assessment unit will be identified as having insufficient information with which to assess the designated use (Sublist 3).

**Table 6.0: Minimum Suite of Parameters for Designated Use Assessments**

<b>Designated Use</b>	<b>Data Requirements (Minimum Suite of Parameters)</b>
General Aquatic Life	Biological data. If biological data is not available: <ul style="list-style-type: none"> <li>• pH, DO, temperature, TP, and TSS (non-tidal waters); or</li> <li>• DO (tidal waters)</li> </ul>
Aquatic Life - Trout	Biological data, temperature, and DO. If biological data is not available: <ul style="list-style-type: none"> <li>• pH, DO, temperature, TP, and TSS</li> </ul>

**Table 6.0 continued**

Recreation	<ul style="list-style-type: none"> <li>• Enterococcus (SC, SE1 waters) ;</li> <li>• fecal coliform (SE2, SE3 waters) ; or</li> <li>• E. coli (FW2, PL waters)</li> </ul>
Fish Consumption	Fish Consumption Advisories for one or more parameters
Shellfish Harvesting	Shellfish Classification
Drinking Water Supply	Nitrate
Ag. Water Supply	TDS and salinity
Industrial Water Supply	TSS and pH

### 6.1 Aquatic Life Use Assessment Method

The aquatic life use is assessed by directly evaluating biotic communities and assessing the health of the aquatic biota. This direct evaluation is performed using biological information that integrates a full suite of environmental conditions over many months (for macroinvertebrates) to many years (for fish-based indicators). When such data are available, the Department bases its aquatic life use assessments upon metrics developed to assess benthic macroinvertebrate data, in conjunction with fin fish IBI (Index of Biotic Integrity) data, and supplemented with a broad suite of biologically relevant physical/chemical data (e.g., dissolved oxygen, temperature, toxic pollutants). The minimum data sets for biologically relevant physical/chemical data will differ depending on stream classification. For instance, the minimum data set for assessing attainment with the aquatic life use-trout is more extensive than the minimum data set used to evaluate the general aquatic life use (see Table 6.1).

When biological data are not available, the Department must rely on biologically-relevant chemical water quality data alone, such as dissolved oxygen (DO), to indirectly assess the health of the biota, even though chemical water quality data provide only a "snapshot" in time rather than the longer-term assessment supported by biological indicators. Table 6.1 summarizes the possible outcomes of the use assessment for aquatic life based upon various combinations of data and results, including the relative weight attributed to different data sets.

**Table 6.1 Aquatic Life Use Assessment Results Based Upon Individual and Integrated Data Sets**

<b>Results of Biological Assessment</b>	<b>Results of Aquatic Life Use Assessment (General and Trout)</b>
<b>Biological Monitoring Data Available, No Chemical/Physical Data Available</b>	
One or more biological data sets indicate no biological impairment	Aquatic life use is attained
One or more biological data sets indicate biological impairment	Aquatic life use is not attained with cause of non-attainment identified as “cause unknown”
<b>Both Biological and Chemical/Physical Data Available</b>	
Biological data indicate no impairment and there are no chemical exceedances and waters are not threatened*	Aquatic life use is attained
Biological data indicate impairment AND chemical/physical data show exceedances of aquatic life criteria or are threatened*	Aquatic life use is not attained with the parameter(s) exceeding criteria identified as the cause
Biological data indicate impairment BUT chemical/physical data show no exceedances of aquatic life criteria	Aquatic life use is not attained with cause of non-attainment identified as “cause unknown
Biological data indicates no impairment BUT chemical/physical data show exceedances of aquatic life criteria or waters quality is threatened *	Aquatic life use is not attained with parameter(s) exceeding criteria identified as the cause.
<b>No Biological Data Available, Chemical/Physical Data Available</b>	
Minimum data requirements not met	Insufficient data to assess aquatic life use
No exceedances of aquatic life criteria	Aquatic life use is attained
Two or more exceedances of aquatic life criteria or water quality is threatened*.	Aquatic life use is not attained with parameter(s) exceeding criteria listed as the cause

\*Threatened is defined as chemical/physical data showing no exceedances of surface water quality criteria but degrading water quality trends indicate that criteria are likely to be exceeded within two years.

As stated earlier, many stream locations are assessed by using both benthic macroinvertebrate data and fin fish IBI data. Because of differences in degrees of pollution sensitivity and differing temporal and spatial scales, assessment results can differ between fish and invertebrates at the same location. When multiple data sets yield contradictory or ambiguous assessment results, the Department will evaluate the strength of the various data sources used to assess aquatic life use attainment. The Department will take into account factors such as age, robustness, and accuracy of the data. Other factors, such as declining trends, may also influence the weight of a given data set.

## 6.2 Recreational Use Assessment Method

The SWQS identify two levels of recreational use – primary contact and secondary contact. Primary contact recreation is defined as those water-related recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing. Secondary contact recreation is defined as those water-related recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing. SWQS criteria have been promulgated for primary contact recreation in SC, SE1, and FW2 waters. SWQS criteria have been promulgated for secondary contact recreation in SE2 and SE3 waters. Primary contact recreation in FW1 and PL waters is assessed using the SWQS criteria for FW2 waters because numeric criteria for recreational use have not been promulgated for FW1 or PL waters.

As explained in Section 4.2 Pathogenic Indicators, assessment for primary contact recreation compares the geometric mean (geomean) of the water quality data for pathogenic indicators to the appropriate SWQS criterion. Exceedance of the numeric SWQS criteria for pathogenic indicators is assessed as not attaining the primary contact recreational use. All sanitary data collected as per the requirements of the geometric mean are used to assess the recreational use, in water both with and without bathing beaches (including coastal waters). "Designated bathing beaches", which are heavily used for primary contact recreation during the recreational season pursuant to the New Jersey State Sanitary Code N.J.A.C. 8:26, are also assessed using beach closure data. Designated bathing beaches are assessed as not impaired if there are no beach closures lasting seven or more consecutive days in a given year, or the average number of beach closures is less than two per year over a five-year period. Short term beach closures (less than one week) generally signify occasional excursions of the pathogen criterion, unless the short term closures occur chronically over several (five or more) years, in which case the beach is assessed as impaired. A week-long beach closure signifies that non-compliance with the pathogen criterion occurred more than once within one week. One beach closure per year of seven or more consecutive days, or an average of two or more beach closures (of any duration) per year over a five-year period, is assessed as not attaining the primary contact recreational use. Table 6.2 summarizes the possible outcomes of the recreational use assessment.

**Table 6.2: Recreational Use Assessment Results**

<b>Assessment</b>	<b>Result</b> (see note below)
Beach closure data does not identify impairment (Primary Contact) <u>and</u> the geometric mean meets SWQS (Primary or Secondary)	Use Is Attained
Beach closure data identifies impairment (Primary Contact) <u>or</u> geometric mean exceeds SWQS (Primary or Secondary )	Use Is Not Attained

Note that in AUs where bathing beaches play a minor role or where several bathing beaches are not impaired and only one is impaired, the Department will look at the water quality of the non-bathing beach areas and the frequency and duration of the SWQS exceedances at the impaired beach before determining the attainment status of the entire assessment unit. In those instances

where the Department uses Best Professional Judgment and determines that the impaired beach area is *de minimus* for the assessment unit, the assessment unit will be assessed as attaining the primary contact recreational use and the *de minimus* impaired beach will be identified in the Integrated Report for follow up sanitary surveys required by the DHSS. See Section 5.1 for a more detailed explanation of *de minimus* data.

### **6.3 Fish Consumption Use Assessment Method**

Fish consumption use assessments are based on the presence of fish consumption advisories resulting from site-specific data rather than statewide advisories. The data collection, risk assessment, and issuance of fish consumption advisories are overseen by the New Jersey Interagency Toxics in Biota Committee (ITBC), a joint effort between the Department and the DHSS. Through the ITBC, research projects are coordinated to monitor levels of contaminants in commercially and recreationally harvested fish, shellfish, and crustacean species. Edible portions of individual animals are tested for one or more bioaccumulative chemicals (e.g., polychlorinated biphenyls (PCBs), chlorinated pesticides, dioxins, and mercury). These data are evaluated for development of consumption advisories, as appropriate, to protect human health.

For all contaminants except mercury, the Department follows USEPA's "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories – Volume 1, 2 and 3 (USEPA 2000b) for establishing fish consumption advisories. For mercury, the ITBC uses human health risk-based mercury guidelines established by the Department (NJDEP, 1994), which closely follow guidelines recommended by the Year 2000 National Research Council report - *Toxicological Effects of Methylmercury* (Commission on Life Sciences, 2000).

Statewide fish consumption advisories are considered insufficient data upon which to base a fish consumption use assessment, since the Department relies on site-specific data evaluated on an assessment unit basis. Where a site-specific fish consumption advisory has been issued for any portion of an assessment unit, including a lake, the entire assessment unit will be assessed as not attaining the fish consumption use and the assessment unit will be placed on the 303(d) List along with all pollutants responsible for the site-specific consumption advisory(ies). Table 6.3 summarizes the possible outcomes of the use assessment for the fish consumption use.

**Table 6.3: Fish Consumption Use Assessment Results**

<b>Assessment</b>	<b>Result</b>
No fish consumption restrictions in effect	Use is Attained
“Restricted Consumption” of fish is in effect for the general population or high risk population.  Note: restricted consumption is defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species.	Use is Not Attained
Fish tissue data is not available	Insufficient Data
Statewide fish consumption advisory is in effect based on extrapolated data	Insufficient Data

#### **6.4 Shellfish Harvest Use Assessment Method**

The shellfish harvest use is designated in all waters classified as SC and SE1. The shellfish sampling and assessment program is overseen by the federal Food and Drug Administration (FDA) and administered through the National Shellfish Sanitation Program (NSSP) to ensure the safe harvest and sale of shellfish. The NSSP’s guidance, entitled *National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish*, is available on the FDA’s Web site at [www.cfsan.fda.gov/~ear/nss3-toc.html](http://www.cfsan.fda.gov/~ear/nss3-toc.html). The Department’s Bureau of Marine Water Monitoring determines shellfish classifications based on sampling data and assessment procedures in the NSSP manual. Waters are classified as approved (“unrestricted”), special restricted, seasonal, or prohibited harvest. Prohibited, special restricted, and seasonal harvest areas are further separated into waters where shellfish harvest is prohibited due to poor water quality or administrative closures based on land use, resource availability, or sanitary surveys. The legal description of shellfish classification areas is updated annually at N.J.A.C. 7:12. The Department’s shellfish classification areas are included in the SWQS by reference at N.J.A.C. 7:9B-1.12.

Administrative closures are established in areas around potential pollution sources, such as sewage outfalls and marinas, as a preventive measure to prevent the harvest of possibly contaminated shellfish. Administrative closures are located in areas immediately adjacent to the sewage treatment plant outfalls in the ocean. In marinas, prohibited areas are established to protect human health from contamination from boat wastes and runoff. Where shellfish harvest is prohibited due an administrative closure that is based on land use (e.g., marinas, treatment plant outfalls, etc.), such prohibited areas will not be included in the overall assessment. Only assessment units containing shellfish waters classified as unrestricted are assessed as attaining the shellfish harvest use. For assessment units that do not attain the shellfish harvest use, the pollutant causing the non-attainment will be identified as fecal or total coliform, as appropriate. Table 6.4 summarizes the possible outcomes of the use assessment for the shellfish harvest use.

**Table 6.4: Shellfish Harvest Use Assessment Results**

<b>NSSP Classification</b>	<b>Assessment Results*</b>
Unrestricted	Use Is Attained
Prohibited, Special Restricted, or Seasonal classifications based on water quality	Use Is Not Attained

\*Note: Assessment units overlap but do not follow shellfish classification boundaries and may contain more than one classification (see Section 5.0). In most instances, the use assessment will be based on the most restrictive classification found within that assessment unit. Where only a *de minimus* portion of the acreage within an assessment unit has some degree of restriction, the assessment will reflect the assessment of the non-*de minimus* area. Any *de minimus* areas that are restricted but are not subject to administrative closures (i.e., the restriction is due to poor water quality) will be identified in the Integrated Report. This assessment method may exaggerate the extent of impairments; therefore, the official adopted Shellfish Classification maps should be referenced for the actual areas approved for shellfish harvest.

## 6.5 Drinking Water Supply Use Assessment Method

The drinking water supply use is defined as waters that are potable after conventional filtration treatment and disinfection, without additional treatment to remove other chemicals. All waters classified as Freshwater (FW2) and Pinelands (PL) are designated as drinking water supply use. It is important to note that many waterbodies do not have drinking water intakes due to stream size and other considerations. Nitrate concentrations are the minimum data necessary to assess the drinking water use; however, other Appendix A parameters (i.e., arsenic, cadmium, chromium, copper, cyanide, lead, mercury, thallium, zinc, nitrate, TDS, chloride, radioactivity, and volatile organic compounds) will also be used to assess the drinking water use when sufficient data for these parameters is available.

In addition to ambient chemical water quality parameters, the Department uses monitoring data from treated or finished water supplies to determine compliance with the Safe Drinking Water Act's National Primary Drinking Water Regulations (NPDWRs, or primary standards) and water supply use restrictions. Pollutants monitored for the protection of human health under the primary standards include volatile organic compounds, semi-volatile organic compounds, inorganic constituents, salinity, radioactive constituents, and disinfection by-products. Use restrictions include closure, contamination-based drinking water supply advisories, better than conventional treatment requirements, and increased monitoring requirements due to confirmed detection of one or more pollutants.

The Department's Bureau of Safe Drinking Water summarizes safe drinking water violations annually. The drinking water use assessment method uses the data provided in these reports. Only violations that can be attributed to surface water sources are considered. Violations for copper and lead, which could be attributed to the collection system, are not used in assessing source water unless the violations occur in ambient waters. Table 6.5 summarizes the possible outcomes of the use assessment for the drinking water use. Since human health concerns from bioaccumulated constituents are generally addressed through consumption advisories, the

Department will review exceedances of human health criteria for such constituents to determine which use is not being attained: the drinking water use, the fish consumption use, or both.

**Table 6.5: Drinking Water Supply Use Assessment Results**

<b>Safe Drinking Water Actions</b>	<b>Assessment Results</b>
No closures, use restrictions, SWQS criteria are met and waters are not threatened*	Use is Attained
Closures are recorded or water quality standards are exceeded or threatened*	Use is Not Attained
Surface water quality is such that more than conventional treatment is required	Use is Not Attained
Contamination-based drinking water supply advisories are in effect	Use is Not Attained
Increased monitoring requirements are in effect due to confirmed detection of one or more pollutants	Use is Not Attained

\*Note: Threatened is defined as chemical/physical data showing no exceedances of surface water quality criteria but degrading water quality trends indicate that criteria are likely to be exceeded within two years.

## **6.6 Industrial Water Supply Use Assessment Method**

Industrial water supply use assessment is conducted for waters used for industrial processing or cooling. The Department will use total suspended solids (TSS) and pH, a measure of acidity, as indicators for assessing attainment of the industrial water supply use. A pH range of 5 to 9 will be used as a threshold for use attainment.

## **6.7 Agricultural Water Supply Use Assessment Method**

The agricultural water supply use includes irrigation and livestock farming. Only waters classified as FW2 and PL are designated for this use. Numeric SWQS criteria have not been promulgated for the agricultural water supply use. The “No increase in background which would interfere with the designated or existing uses, or 500 mg/L, whichever is more stringent” criteria stated in the Surface Water Quality Standards was promulgated to protect drinking water uses. In order to evaluate water supplies that support agriculture in New Jersey, guidelines are referenced from the U.S. Department of Interior Natural Resources Conservation and other states (Follet and Soltanpour, 1999; Bauder, 1998). These guidelines are used to evaluate whether water supplies support common agricultural uses such as irrigation and raising livestock. For the assessment, total dissolved solids (TDS) and salinity were selected as indicators of agricultural use. Salinity was chosen due to its adverse and immediate detrimental effects on all agricultural practices. TDS has similar negative effects and also indicates possible contamination from runoff. The more stringent of the recommended standards for irrigation and livestock is applied in the assessment of the agricultural water supply use. Acceptable levels for TDS and salinity were established as at or below 2,000 mg/l (Follet and Soltanpour, 1999). If TDS or salinity data are not available, specific conductance is used as a surrogate with a specific conductance of 3,000 us/cm approximately equivalent to TDS and salinity levels of 2,000 mg/l (United Nations, 1985). Toxics are also a primary concern for agricultural water supply uses; however, the State’s

criteria for toxics apply to human health and aquatic life protection, which are more stringent than the criteria needed for agricultural use. Several other states have established criteria for agricultural uses and further research will be done to evaluate the feasibility of applying their criteria to assess attainment of the agricultural water supply use in New Jersey.

## 7.0 Integrated Listing Guidance

The 2006 Integrated Report Guidance (USEPA, 2005, supplemented by October 12, 2006 memo) recommends placing assessment results into one of five specific categories on the Integrated List. Based on this guidance and the Department's listing methodology (explained in Section 1.1), the five sublists used to identify an assessment unit on the Department's Integrated List are described below.

- Sublist 1: An assessment unit is attaining all applicable designated uses and no uses are threatened. (The Department does not include the fish consumption use for this sublist.)
- Sublist 2: The assessment unit is attaining the designated use but is not attaining another/other applicable designated use(s).
- Sublist 3: Insufficient data and information are available to determine if the designated use is attained.
- Sublist 4: One or more designated uses are not attained or are threatened but TMDL development is not required because (three sub-categories):
  - A. A TMDL has been completed for the parameter causing the non-attainment.
  - B. Other enforceable pollutant control measures are reasonably expected to result in the attainment of the designated use in the near future.
  - C. Non-attainment of the designated use is caused by something other than a pollutant.
- Sublist 5: One or more designated uses are not attained or are threatened by a pollutant(s), which requires development of a TMDL.

## 7.1 Integrated Listing Methodology

The Department will develop the Integrated List by assessment unit/designated use combinations, not just by assessment unit. This will enable the Department to assign each designated use in each assessment unit to the appropriate sublist; however, it also means that some assessment units will be assigned to multiple sublists.

Table 7.1 describes how the results of the individual designated use assessments will be integrated to determine the listing assignment for each assessment unit/designated use combination. Because the same pollutant could result in multiple designated uses being assigned to Sublist 5, the Department will identify, on a separate List of Water Quality Limited Segments (303(d) List), the pollutant(s) causing non-attainment of the applicable designated use(s) for each assessment unit assigned to Sublist 5. For example, exceedances of mercury could result in the same assessment unit being assigned to Sublist 5 multiple times for not attaining the aquatic life

use, the drinking water use, and the fish consumption use. The assessment unit would be listed once on the List of Water Quality Limited Segments (303(d) List) as not attaining its designated uses because of mercury. However, the same assessment unit may also appear on the 303(d) List multiple times, if there are other pollutants causing non-attainment of the same use or other designated uses. Thus, the 303(d) List will provide a more accurate picture of the number of different TMDLs needed to address pollutants causing non-attainment.

**Table 7.1: Integrated Listing Method**

<b>Sublist</b>	<b>Assessment Results</b>
<b>Sublist 1:</b> All designated uses are assessed and attained, with the exception of fish consumption.	Full Attainment (All Uses Are Attained)
<b>Sublist 2:</b> The designated use is attained but other designated uses within the assessment unit are either not assessed due to insufficient data or not attained.	Use Attained
<b>Sublist 3:</b> Insufficient data is available to determine if the designated use is attained.	Insufficient Data
<b>Sublist 4a:</b> The designated use is not attained or is threatened and development of a TMDL is not required because a TMDL for the parameter responsible has already been approved by USEPA.	Use Not Attained (TMDL Not Required)
<b>Sublist 4b:</b> The designated use is not attained or is threatened and development of a TMDL is not required because other enforceable pollutant control measures are reasonably expected to result in the attainment of the designated use in the near future.	Use Not Attained (TMDL Not Required)
<b>Sublist 4c:</b> The designated use is not attained or is threatened and development of a TMDL is not required because the cause was attributed solely to pollution, <u>not</u> pollutant(s).	Use Not Attained (TMDL Not Required)
<b>Sublist 5:</b> The designated use is not attained or is threatened by a pollutant and development of a TMDL is required.	Use Not Attained (TMDL Required)

## 7.2 Identifying Causes and Sources of Non-attainment (303(d) List)

In assessing use attainment, the Department's primary focus is the evaluation of all readily available data and information (see Chapter 3). Site-specific data meeting QA/QC requirements (see Section 3.1) may be used to identify the cause (pollutant) of non-attainment. Some of that information may include knowledge of conditions known or likely to be the source of a pollutant or impairment. In some cases, monitoring staff may have knowledge of particular discharges or land use conditions that could potentially be the source of the pollutants, but they lack specific information or resources to conduct a thorough investigative study to verify causes and sources. Thus, it is not unusual for the source and cause of biological impairment, or the source of the pollutants causing non-attainment, to be unknown. When there is definitive information regarding the cause of non-attainment (i.e., a specific pollutant), it will be identified on the 303(d) List. If the cause is unknown, the cause will be identified on the 303(d) List as "cause unknown". Sources of pollutants and impairment causing non-attainment are identified based on the best estimations of Department staff. Once an assessment unit is identified on the 303(d) List and is scheduled for TMDL development, a more thorough investigative study will be conducted to determine the cause, if previously unknown, and the sources of the pollutant. These investigations may include but are not limited to more intensive ambient water quality sampling, aquatic toxicity studies, sediment, or fish tissue analysis and/or dilution calculations of known discharges.

## 7.3 Delisting Assessment Unit/Pollutant Combinations

For assessment unit/pollutant combinations identified on the List of Water Quality Limited Segments (303(d) List), there are numerous scenarios that could result in an assessment unit being removed from this list (i.e., "delisting"). The delisting codes and descriptions are intended to be consistent with the terminology used in USEPA's Assessment Database (ADB) used for reporting final results to USEPA. Some scenarios that could result in the removal of an assessment unit/pollutant combination are explained below in Table 7.3. The reason for any delisting reflected in the 2010 Integrated List will be documented in Appendix C of the 2010 Integrated Report.

**Table 7.3: Delisting Definitions**

<b>Delisting Code</b>	<b>Delisting Description</b>	<b>Delisting Definition</b>
1	SWQS are met	<b>Delisting:</b> Applicable SWQS are being met because water quality has been restored
2	Flaws in original listing	<b>Delisting:</b> Applicable SWQS are being met and the assessment unit/parameter combination was incorrectly listed in a previous 303(d) list
3	TMDL Alternative (4b)	<b>Delisting but still impaired:</b> Assessment unit/parameter combination is not attained but development of a TMDL is not required because water quality will be restored by control measures for point and/or nonpoint sources

Table 7.3: Continued

Delisting Code	Delisting Description	Delisting Definition
4	Not caused by a pollutant (4c)	<b>Delisting but still impaired:</b> Assessment unit/parameter combination is not attained but development of a TMDL is not required since the cause is something other than a Clean Water Act pollutant, such as flow alteration
5	TMDL approved or established by USEPA (4a)	<b>Delisting but still impaired:</b> Assessment unit/parameter combination is not attained but development of a TMDL is not required because a TMDL has already been approved or adopted by USEPA.
6	Waterbody not in State's jurisdiction	<b>Delisting:</b> Assessment unit/parameter combination was incorrectly included on a previous 303(d) List
7	Other	Code not currently used by NJDEP
8	Applicable SWQS met due to restoration activities	<b>Restoration:</b> Applicable SWQS are being met because water quality has been restored due to restoration activities
9	Amended SWQS	<b>Restoration:</b> Applicable SWQS are being met due to amendments to the SWQS adopted since the previous assessment
10	Applicable SWQS are met according to new assessment method	<b>Restoration:</b> Applicable SWQS are being met based on the results of a new assessment method
11	Applicable SWQS are met; original basis for listing was incorrect	<b>Restoration:</b> Assessment unit/parameter combination is found to attain the applicable SWQS because the original basis for the decision was incorrect. (Examples: Natural conditions, flow- related decisions, narrative criteria compliance such as "Exit Ramp" studies)
12	Applicable SWQS met; threatened water no longer threatened	<b>Restoration:</b> New Jersey is not using this category
13	Applicable SWQS met; reason for recovery unspecified	<b>Restoration:</b> Assessment unit/parameter combination is currently found to meet the applicable SWQS but the reason for water quality improvement is unknown
14	Data and/or information lacking to assess compliance with the applicable SWQS - original basis for listing was incorrect	<b>Delisting:</b> Assessment unit/parameter combination was incorrectly included on a previous 303(d) List; however, there is insufficient information to assess compliance with applicable SWQS

## 8.0 Method to Rank and Prioritize Assessment Units That Are Not Attaining Designated Uses

Section 303(d) of the federal Clean Water Act requires states to rank and prioritize assessment units that require development of TMDLs (i.e., assessment units identified as Sublist 5). The goal of priority ranking is to focus available resources on developing TMDLs in the most effective and efficient manner, while taking into account environmental, social, and political factors. Assessment units ranked as high (H) priority for TMDL development, based on the factors outlined below, are those the Department expects to complete within the next two years. Assessment units ranked as medium (M) priority are those the Department expects to complete in the near future, but not within the next two years. Assessment units ranked as low (L) priority are those the Department does not expect to complete in the immediate or near future. The Department will prioritize assessment units identified on the 303(d) List and schedule them for TMDL development based on the following factors:

- Importance of pollutants of concern (refer to Table 8.0);
- TMDL complexity;
- Status of parameter (actively produced or legacy pollutant);
- Additional data and information collection needs;
- Sources of pollutants;
- Severity of the actual or threatened exceedance/impairment;
- Spatial extent of the exceedance/impairment;
- Nature of the designated uses not being attained (i.e., recreational, economic, cultural, historic, and aesthetic importance);
- Efficiencies of grouping TMDLs by drainage basin or parameter;
- Efficiencies related to leveraging water quality studies triggered by NJPDES permit renewals;
- Status of TMDLs currently under development;
- Timing of TMDLs for shared waters;
- Status of watershed management activities (e.g., priority watershed selection or 319 grant activities);
- Status of other ongoing pollutant/pollution control actions that could result in water quality restoration (e.g., site remediation activities);
- Existence of endangered and sensitive aquatic species;
- Recreational, economic, cultural, historic and aesthetic importance; and
- Degree of public interest and support for addressing particular assessment units.

**Table 8.0: Importance of Pollutants of Concern**

<b>Pollutant of Concern</b>	<b>Importance</b>
Pathogen indicators, nitrate	Direct human health issues
Metals and Toxics	<ul style="list-style-type: none"> <li>• Direct human health issues</li> <li>• Designated use impacts</li> </ul>
Other conventional pollutants such as phosphorous, pH, dissolved oxygen, temperature, total dissolved solids, total suspended solids, unionized ammonia	<ul style="list-style-type: none"> <li>• Significant designated use implications</li> <li>• Indirect human health issues</li> </ul>

## **9.0 Method for Developing the Monitoring and Assessment Plan**

The Integrated Report guidance (USEPA, 2005) recommends that states include descriptions and schedules of additional monitoring needed to: 1) assess all designated uses in all attainment units, and 2) support development of TMDLs for all assessment unit/pollutant combinations identified as not attaining designated uses. New Jersey's 2010 Integrated Report will identify its future monitoring plans and needs in Appendix H: New Jersey's Water Monitoring and Assessment Strategy, as well as in Chapter 9 Next Steps: Preparing for 2012 and Beyond. Chapter 9 of the 2010 Integrated Report summarizes the information gaps and steps the Department is taking to bridge data gaps and improve assessment methods.

The Department's goal for water monitoring and assessment is to ultimately have enough data to assess every designated use in every assessment unit and for assessment results to indicate that every assessment unit is in full attainment, i.e., attaining every applicable designated use (except fish consumption). It is important to recognize that monitoring and assessing each assessment unit will require significant effort and can only be accomplished over the long term. Several strategies will be key to accomplishing this goal including:

- Exchanging and using data and assessments from other programs within the Department and other entities (e.g., local government, volunteer monitoring groups);
- Expanding ongoing and planned monitoring and assessment to address data limitations for assessment units assigned to Sublist 3.

## 10.0 Public Participation

The public is afforded the opportunity to participate in three key phases of development of the Integrated Report: 1) submission of data, 2) review of and comment on the proposed assessment methods; and 3) review of and comment on the proposed Integrated List and 303(d) List. Section 10.1 explains the Department's process for soliciting data for use in the Integrated Report. The Department also strives to continuously interact with other data collecting organizations and facilitate the exchange of data and information.

The New Jersey Water Monitoring Coordinating Council was established on October 24, 2003 and serves as a statewide body to promote and facilitate the coordination, collaboration, and communication of scientifically sound, ambient water quality and quantity information to support effective environmental management. The Council consists of representatives from various Divisions within the Department; USGS; USEPA Region 2; the Delaware River Basin, Pinelands, and Meadowlands Commissions; the Interstate Environmental Commission; county health departments, academia; and the volunteer monitoring community, and provides the opportunity to exchange information and data among its participants.

The Department, through its Volunteer Monitoring Program, has been working to identify volunteer groups that collect data and are interested in submitting it for use in Integrated Reports. The Watershed Watch Network serves as an umbrella organization for all of New Jersey's volunteer monitoring programs. Volunteer monitoring program managers throughout the State make up the Watershed Watch Network Council. A four-tiered approach has been developed to allow volunteers to pick their level of involvement based on the purpose of their monitoring program, the intended data use, and the intended data users. The goal of this program is to provide acceptable protocols and QA/QC requirements for volunteers who choose to submit their data to the Department, assist volunteers in designing and building upon their existing programs, and assist data users in gathering sound data for their desired uses. Additional information on the four-tier volunteer monitoring approach is available on the Department's Web site at <http://www.state.nj.us/dep/wms/bfbm/vm/index.html>.

Section 10.2 explains the Department's process for announcing public availability of the draft Methods Document, draft Integrated List, and draft 303(d) List for review and comment prior to adoption of the final Methods Document and Lists. As explained in Chapter 1, the Integrated Report combines the reporting requirements of Sections 305(b) and 303(d) of the federal Clean Water Act. The Integrated List component of the Report, which categorizes the results of use assessments for all the State's assessment units into sublists (Sublists 1 through 5), satisfies the reporting requirements of Section 305(b) formerly addressed by the Statewide Water Quality Inventory Report. The 303(d) List component of the Report, which satisfies the reporting requirements of Section 303(d), includes the assessment units identified as not attaining one or more designated uses (Sublist 5), the pollutants causing non-attainment of those assessment units, and their priority ranking for TMDL development. The public participation requirements of these two components are different. The 303(d) requirements are considered regulatory requirements because they trigger TMDL development. Therefore, the regulatory requirements identified in this section regarding public participation, USEPA approval, and adoption apply only to the 303(d) List component of the Integrated Report.

The Department is required under 40 CFR 130.7(b)(6) to provide a description of the methodology used to develop the 303(d) List. This Methods Document lays out the framework for assessing data and categorizing assessment units into the five sublists of the Integrated List. The Department develops a draft Methods Document that is made available for public review and comment through public notification, as outlined below. After finalizing the Methods Document, the Department assesses the data in accordance with those methods and develops the Integrated Report, which includes the draft Integrated List, draft 303(d) List, and two-year TMDL Schedule. A public notice is published in the New Jersey Register and newspapers of general circulation announcing that the draft Integrated List and draft 303(d) List are available for public review and comment. The Integrated List and 303(d) List are revised, as appropriate, after full consideration of comments received. The public participation procedures related to proposal and adoption of the Integrated List and final 303(d) List are outlined in Section 10.2 below.

## 10.1 Request for Data

The Department pursues several avenues for notifying the public of its intent to seek water quality-related data and information from external partners, including notices published in the New Jersey Register, public notices published in newspapers of general circulation, announcements published in Department-generated newsletters, and direct mailings to interested individuals and organizations. The six-month time period for submitting data is specified in the public notice. A cut-off date for submission of data is established 15 months prior to the Department's deadline for completing the Integrated Report (usually April 1<sup>st</sup> of even-numbered years). This is consistent with the neighboring States of Delaware and Pennsylvania, as well as the Delaware River Basin Commission. A cut-off date for data submission is necessary to allow the data to be received, analyzed, and assessed for timely completion of the Integrated Report. If data arrives past the cut-off date for the current report, it will be considered for the next report.

In determining which data are appropriate and readily available for assessment purposes, the Department will consider quality assurance/quality control, monitoring design, age of data, accurate sampling location information, data documentation, and use of electronic data management (see Chapter 3). A data package submitted to the Department for use in the Integrated Report should include:

- The approved quality assurance project plan (see Section 3.1 Data Quality)
- Data provided in electronic format. The Department prefers that all data be entered into USEPA's STORET database (see next bullet). Volunteer organizations may also submit data through the Department's new data management system for volunteer monitoring data at <http://www.state.nj.us/dep/wms/bfbm/vm/database.html>.
- The Department is aware that USEPA is moving away from the STORET Data Management model and towards a new standard for water quality data exchange. The Department is currently developing tools and a Web-based system for this exchange and expects to have the enhanced data exchange process in place for this 2010 Integrated Report.

- Station location data should be provided in a GIS shape file or compatible format when possible. Station locations identified by latitude and longitude must also be mapped on a USGS Quadrangle Sheet (or copy of a section of a sheet with the name of the sheet identified); and,
- A citable report summarizing the data that includes name, address, and telephone number of the entity that generated the data set.

The Department is working with data-generating organizations to organize their data, provide training in acceptable sampling techniques, and certify laboratories and field measurement protocols. Additional information is available on the Department's Volunteer Monitoring Web site at <http://www.state.nj.us/dep/wms/bfbm/vm/index.html>.

## 10.2 Public Notification

**Public Notices:** The Department will publish a notice announcing the availability of the draft Methods Document for public review and requesting comments. The Department may revise the Methods Document based on public comment.

The Department shall propose the 303(d) List of Water Quality Limited Segments as an amendment to the Statewide Water Quality Management Plan, provide an opportunity for public comment, and adopt the amendment in accordance with N.J.A.C. 7:15-6.4. A public notice announcing availability of the proposed 303(d) List for public review and comment shall be published in the New Jersey Register, on the Department's Web site, and in newspapers of general circulation throughout the State. Adjacent state, federal, and interstate agencies shall also be notified, as necessary. The public notice shall include the following:

- A description of the procedures for comment; and
- The name, address, and Web site of the Department office or agent from which the proposed document may be obtained and to which comments may be submitted.

**Comment Period:** The comment period shall be a minimum of 30 days.

**Public Hearings:** Within 30 days of publication of the public notice, interested persons may submit a written request to extend the comment period for an additional 30 days, or request a public hearing. If the Department determines that there are significant environmental issues or that there is a significant degree of public interest, the Department may hold a public hearing and/or extend the comment period. If granted, a notice announcing extension of the comment period and/or public hearing shall be published promptly on the Department's Web site.

**Final Action:** After the close of the public comment period for the Methods Document, the Department will address the comments and publish the final Methods Document on the Department's Web site along with the Response to Comments.

After the close of the public comment period for the List of Water Quality Limited Segments, the Department will address the public comments, make any necessary revisions, and prepare a final

List of Water Quality Limited Segments. The Department will submit the final List of Water Quality Limited Segments to USEPA Region 2 in accordance with 40 CFR 130.7. Upon receipt of a response from USEPA Region 2, the Department may amend the final list based on their comments. The Department will adopt the List of Water Quality Limited Segments as an amendment to the Statewide Water Quality Management Plan by placing a notice in the New Jersey Register and on the Department's Web site. However, the Department may repropose the List of Water Quality Limited Segments, if the Department determines that revisions made in response to USEPA Region 2 comments result in substantive changes that should be subject to public review and comment.

**Availability of Final Documents:** The Integrated Report, which will include the Integrated List, monitoring needs and schedules, TMDL needs and schedules, and any other information usually included in the 305(b) Report, will be submitted to the USEPA Region 2 as required by Section 305(b) of the federal Clean Water Act. The Department will post the final Integrated Report and the 303(d) list after receipt of approval from the USEPA at [www.nj.gov/dep/wms](http://www.nj.gov/dep/wms).

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**See also:**

NJDEP, *Surface Water Quality Standards Proposed Readoption with Amendments*: N.J.A. C. 7:9B at <http://www.nj.gov/dep/rules/proposals/042009a.pdf>

*New Jersey Nutrient Criteria Enhancement Plan*, April 2009 at [http://www.state.nj.us/dep/wms/bwqsa/Nutrient\\_Criteria\\_Enhancement\\_Plan.pdf](http://www.state.nj.us/dep/wms/bwqsa/Nutrient_Criteria_Enhancement_Plan.pdf)

### Appendix A

A listing of all the parameters the Department might use in the assessment process and the designated uses associated with each parameter.

Parameter	Aquatic Life (general and trout)	Recreation	Drinking Water Supply	Agricultural Water Supply	Industrial Water Supply	Shellfish Harvest	Fish Consumption
Biological Community Data:	X						
Fish Advisories (contaminants in tissue only )							X
Shellfish Closures						X	
Beach Closure Data		X					
Dissolved Oxygen	X						
Enterococci (saline)		X					
Fecal Coliform (saline)		X*				X	
E. Coli (freshwater)		X					
Total Coliform						X	
pH (Standard Units)	X		X		X		

Phosphorus, Total	X						
Solids, Suspended (TSS)	X				X		
Salinity				X			

\* secondary only

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
Solids, Total Dissolved (TDS)			X	X	X		
Sulfate			X				
Temperature	X						
Turbidity	X						
Ammonia, un-ionized	X						
Acenaphthene			X				
Acrolein			X				
Acrylonitrile			X				
Aldrin	X		X				
Anthracene			X				
Antimony			X				
Arsenic	X		X				
Asbestos			X				
Barium			X				
Benz(a)anthracene			X				
Benzene			X				
Benzidine			X				
3,4-Benzofluoranthene (Benzo(b)fluoranthene)			X				
Benzo(k)fluoranthene			X				

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
Benzo(a)pyrene (BaP)			X				
Beryllium			X				
alpha-BHC (alpha-HCH)			X				
beta-BHC (beta-HCH)			X				
gamma-BHC (gamma-HCH/Lindane)	X		X				
Bis(2-chloroethyl) ether			X				
Bis(2-chloroisopropyl) ether			X				
Bis(2-ethylhexyl) phthalate			X				
Bromodichloromethane (Dichlorobromomethane)			X				
Bromoform			X				
Butyl benzyl phthalate			X				
Cadmium	X		X				
Carbon tetrachloride			X				
Chlordane	X		X				X
Chloride	X		X				
Chlorine Produced Oxidants (CPO)	X		X				
Chlorobenzene			X				
Chloroform			X				
2-Chloronaphthalene			X				
2-Chlorophenol			X				

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
Chlorpyrifos	X		X				
Chromium			X				
Chromium+3	X		X				
Chromium+6	X		X				
Chrysene			X				
Copper	X		X				
Cyanide (Total)	X		X				
4,4'-DDD (p,p'-TDE)			X				X
4,4'-DDE	X		X				X
4,4'-DDT	X		X				X
Demeton	X		X				
Dibenz(a,h)anthracene			X				
Dibromochloromethane (Chlorodibromomethane)			X				
Di-n-butyl phthalate			X				
1,2-Dichlorobenzene			X				
1,3-Dichlorobenzene			X				
1,4-Dichlorobenzene			X				
3,3'-Dichlorobenzidine			X				
1,2-Dichloroethane			X				
1,1-Dichloroethylene			X				

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
trans-1,2-Dichloroethylene			X				
2,4-Dichlorophenol			X				
1,2-Dichloropropane			X				
1,3-Dichloropropene (cis and trans)			X				
Dieldrin	X		X				X
Diethyl phthalate			X				
2,4-Dimethyl phenol			X				
4,6-Dinitro-o-cresol			X				
2,4-Dinitrophenol			X				
2,4-Dinitrotoluene			X				
1,2-Diphenylhydrazine			X				
Endosulfans (alpha and beta)	X		X				
Endosulfan sulfate			X				
Endrin	X		X				
Endrin aldehyde			X				
Ethylbenzene			X				
Fluoranthene			X				
Fluorene			X				
Guthion	X						
Heptachlor	X		X				
Heptachlor epoxide			X				
Hexachlorobenzene			X				
Hexachlorobutadiene			X				
Hexachlorocyclopentadiene			X				

Parameter	Aquatic Life (general and trout)	Recreation	Drinking Water Supply	Agricultural Water Supply	Industrial Water Supply	Shellfish Harvest	Fish Consumption
Hexachloroethane			X				
Indeno(1,2,3-cd)pyrene			X				
Isophorone			X				
Lead	X		X				
Malathion	X						
Manganese			X				
Mercury	X		X				X
Methoxychlor	X		X				
Methyl bromide (bromomethane)			X				
Methyl t-butyl ether (MTBE)			X				
Methylene chloride			X				
Mirex	X		X				
Nickel	X		X				
Nitrate (as N)			X				
Nitrobenzene			X				
N-Nitrosodi-n-butylamine			X				
N-Nitrosodiethylamine			X				
N-Nitrosodimethylamine			X				
N-Nitrosodiphenylamine			X				
N-Nitrosodi-n-propylamine (Di-n-propylnitrosamine)			X				
N-Nitrosopyrrolidine			X				

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
Parathion	X						
Pentachlorobenzene			X				
Pentachlorophenol	X		X				
Phenol			X				
Phosphorous	X						
Polychlorinated biphenyls (PCBs)	X		X				X
Pyrene			X				
Selenium	X		X				
Silver	X		X				
Sulfide-hydrogen sulfide (undissociated)	X						
1,2,4,5-Tetrachlorobenzene			X				
2,3,7,8-Tetrachlorodibenzo			X				
-p-dioxin (TCDD)			X				X
1,1,2,2-Tetrachloroethane			X				
Tetrachloroethylene			X				
Thallium			X				
Toluene			X				
Toxaphene	X		X				
1,2,4-Trichlorobenzene			X				
1,1,1-Trichloroethane			X				
1,1,2-Trichloroethane			X				

<b>Parameter</b>	<b>Aquatic Life (general and trout)</b>	<b>Recreation</b>	<b>Drinking Water Supply</b>	<b>Agricultural Water Supply</b>	<b>Industrial Water Supply</b>	<b>Shellfish Harvest</b>	<b>Fish Consumption</b>
Trichloroethylene			X				
2,4,5-Trichlorophenol			X				
2,4,6-Trichlorophenol			X				
Vinyl chloride			X				
Zinc	X						
Radioactivity			X				

